

SEQUENCE LISTING

<110> DSM N.V.

<120> Genes encoding enzymes in the biosynthesis of pimarin and applications thereof

<130> S-2959

<140> 10/018,009

<141> 2000-06-14

<160> 14

<170> PatentIn Ver. 2.1

<210> 1

<211> 5544

<212> DNA

<213> Streptomyces natalensis

<220>

<221> CDS

<222> (1)..(5544)

<400> 1

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cgc	tat	atc	gtc	gcc	gat	gcc	ttt	gac	gca	cat	ctg	cgg	gac	ggg	ctg	4992	
Arg	Tyr	Ile	Val	Ala	Asp	Ala	Phe	Asp	Ala	His	Leu	Arg	Asp	Gly	Leu		
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agt	ctg	agc	gag	cgg	gac	ctg	gag	cgg	ctg	cgc	gag	gcc	cgg	ctg	tcc	5040	
Ser	Leu	Ser	Glu	Arg	Asp	Leu	Glu	Arg	Leu	Arg	Glu	Ala	Arg	Leu	Ser		
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ggc	ctc	gac	gag	gcc	gaa	cag	cac	gcg	ctc	gta	ctg	gcc	ctg	gtc	ctc	5088	
Gly	Leu	Asp	Glu	Ala	Glu	Gln	His	Ala	Leu	Val	Leu	Ala	Leu	Val	Leu		
			1685					1690					1695				
gcc	gag	acc	tcg	gcc	gtg	ctc	ggc	ggc	cag	gag	acg	cct	ggc	gag	gag	5136	
Ala	Glu	Thr	Ser	Ala	Val	Leu	Gly	Gly	Gln	Glu	Thr	Pro	Gly	Glu	Glu		
		1700						1705					1710				
ccg	cac	ggc	gag	gag	ggc	cac	cgc	acg	ttc	aag	gag	atg	ggc	atc	aac	5184	
Pro	His	Gly	Glu	Glu	Gly	His	Arg	Thr	Phe	Lys	Glu	Met	Gly	Ile	Asn		

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Ser Leu Asn Ala Val Glu Leu Arg Asn Arg Leu Ile Ala Ala Thr Asp			
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ctg cgg ctt ccc gcc acg ctc gtc tac gac tac ccc acg ccg aag gcc			5280
Leu Arg Leu Pro Ala Thr Leu Val Tyr Asp Tyr Pro Thr Pro Lys Ala			
1745	1750	1755	1760
gtc gtc cga ctc gta cgc gaa cga ctc gcg cga ccg gcc tcc ccc gca			5328
Val Val Arg Leu Val Arg Glu Arg Leu Ala Arg Pro Ala Ser Pro Ala			
1765	1770	1775	
cgc gat gtg gcc tcc gtc gtg gcc gag ttg gag tcc ctg ctg acg gcc			5376
Arg Asp Val Ala Ser Val Val Ala Glu Leu Glu Ser Leu Leu Thr Ala			
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Gly Ala Glu Val Ser Glu Glu Thr Ala Ala Arg Leu Lys Ala Val Thr			
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gcg gtg tcg acg ggg acg acg ggg tcg ggc agc ggt acg ggc gcc ggc			5472
Ala Val Ser Thr Gly Thr Thr Gly Ser Gly Ser Gly Thr Gly Ala Gly			
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Ser Gly Gly Ala Leu Asp Leu Val Ser Ala Ser Asp Glu Glu Leu Phe			
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1845			

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<213> Streptomyces natalensis

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Ala	Val	Glu	Ser	Ala	Pro	Asp	Ala	Val	Ala	Leu	Val	Asp	Gly	Thr	Val
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Pro	Gly	Pro	Gly	Arg	Met	Trp	Arg	Ala	Asp	Val	Asp	Ala	Leu	Ala	Arg
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Gly	Leu	Gln	Glu	Ser	Gly	Ile	Ala	Pro	Gly	Asp	Val	Val	Ala	Val	Arg
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Leu	Pro	Asn	Cys	Gly	Arg	Phe	Pro	Thr	Leu	His	Leu	Ala	Val	Ala	Ala
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Val	Gly	Ala	Val	Leu	Leu	Pro	Ile	His	Gln	Gly	Thr	Pro	Leu	Pro	Glu
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Val	Asp	Ala	Leu	Leu	Thr	Arg	Ala	Glu	Pro	Ala	Leu	Leu	Val	Leu	Ser
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Ala	Ala	Gly	Ser	Asp	Gly	Leu	Ala	Thr	Ala	Arg	Ser	Leu	Leu	Glu	Ser
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Val	Pro	Ser	Leu	Arg	Gly	Val	Leu	Leu	Ala	Gly	Ala	Ser	Gly	Asp	Gly
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Glu	Ser	Gly	Ser	Val	Gly	Gly	Gly	Glu	Ser	Gly	Ser	Gly	Arg	Arg	Ser
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Asp	Val	Thr	Pro	Asp	Met	Pro	Leu	Val	Leu	Val	Pro	Ser	Ser	Gly	Thr
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Ser	Asn	Thr	Ala	Ala	Val	Thr	Ala	Glu	Ala	Ala	Asp	Ala	Phe	Asp	Gly
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Pro	Val	Leu	Thr	Ala	Cys	Pro	Met	Thr	His	Leu	Phe	Gly	Leu	Gln	Ser
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Trp	Asp	Val	Asp	Arg	Phe	Leu	Glu	Gln	Ala	Arg	Glu	His	Gly	Pro	Arg
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Val	Val	Phe	Ala	Val	Pro	Ala	Gln	Leu	Arg	Asp	Val	Val	Thr	Arg	Leu
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Ala	Arg	Thr	Gly	Glu	Pro	Ala	Gly	Phe	Thr	Pro	Tyr	Gln	Val	Arg	Thr
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Ala	Gly	Ala	Ala	Val	Ala	Pro	Ala	Leu	Ala	Val	Arg	Val	Arg	Ala	Val
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Leu	Asp	Cys	Glu	Leu	Val	Val	Val	Trp	Gly	Met	Ser	Glu	Ile	Gly	Thr
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Gly	Thr	Arg	Thr	Arg	Ala	His	His	Pro	Asp	Gly	Cys	Val	Gly	Glu	Pro
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Val	Ser	Gly	Val	Asp	Val	Arg	Val	Val	Asp	Glu	His	Gly	Gln	Glu	Cys
			370					375					380		
Ala	Ala	Asp	Glu	Arg	Gly	Glu	Leu	Gln	Tyr	Arg	Gly	Pro	Gly	Leu	Phe

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Arg Gly Tyr Phe	Arg Glu Pro Glu Leu Thr	Arg Ser Ala Leu Thr	Asp			
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Asp Gly Trp Leu	Arg Thr Gly Asp Leu Ala Thr Val	Asp Ala Asp Gly				
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Val Val Val Leu	His Gly Arg Ala Ala Glu Leu Ile	Asn Thr Gly Gly				
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Arg Lys Phe Ser	Ala Gly Glu Val Glu Gly Leu Leu Ser	Gly Phe Thr				
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Asp Leu Gly Pro	Leu Ala Val Val Gly Ala Pro Asp Asp	Arg Leu Gly				
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Glu Tyr Pro Cys	Leu Val Val Thr Asp His Ala Asp Gly Thr	Ile Gly				
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Leu Ser Glu Val	Thr Ala Phe Leu Arg Arg Leu Gly Leu Ala	Asp His				
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Lys Ile Pro Leu	Glu Leu Val Thr Val Arg Glu Leu Pro Phe Ser	Pro				
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Ala Gly Lys Leu	Asp Arg Gly Ala Leu Lys Arg Leu Leu Ala	Asn Leu				
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Ala Glu Glu Ala	Leu Asp Leu Val Arg Asp Cys Val Gly Arg Val	Leu				
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Arg Tyr Gly Gly	Ala Ala Val Pro Phe Pro Pro Asp Lys Asp Phe Phe					
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Ser Pro Asp Lys	Asp Phe Arg Gln Leu Gly Leu Asp Ser Ile Gly Ala					
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Val Arg Leu Arg	Asn Leu Leu Arg Glu Glu Thr Gly Leu Pro Leu Pro					
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Ala Thr Leu Ala	Phe Asp Ser Pro Thr Pro Arg Ala Val Ala Arg Val					
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Leu Ala Glu Gln	Glu Glu Pro Ser Gln Asp Glu Pro Arg Glu Asn Pro					
	645		650			655
Ala Asp Gly Ala	Asp Pro Val Ala Ile Val Gly Met Ala Cys Arg Leu					
	660		665			670
Pro Gly Gly Ala	Asp Ser Pro Asp Ala Leu Trp Glu Leu Leu Ala Asp					
	675		680			685
Gly Thr Asp Ala	Met Ser Pro Phe Pro Thr Asp Arg Gly Trp Asp Leu					

690	695	700
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Leu Leu Leu Glu Ala Ala Trp Glu Thr Phe Glu Arg Ala Gly Ile Asp 755 760 765		
Pro Gln Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Thr Gly Ala Met 770 775 780		
Asp Arg Gly Tyr Gly Thr Ser Ala Ser Ala Ala Pro Ser Ala Trp Glu 785 790 795 800		
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Ser Ser Ser Ser Leu Val Ala Leu His Leu Ala Cys Arg Ser Leu Arg 835 840 845		
Ser Gly Glu Thr Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala 850 855 860		
Thr Pro Ala Pro Phe Ala His Phe Ser Arg Leu Arg Ala Leu Ser Pro 865 870 875 880		
Asp Ser Arg Ser Met Ala Tyr Ala Asp Ala Ala Asn Gly Ser Ala Trp 885 890 895		
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Arg Asn Gly His Arg Val Leu Ala Leu Val Arg Gly Ser Ala Val Asn 915 920 925		
Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln 930 935 940		
Gln Arg Val Ile Arg Gln Ala Leu Ala Asp Ala Gly Leu Thr Pro Gln 945 950 955 960		
Asp Val Asp Ala Val Glu Gly His Gly Thr Gly Thr Pro Leu Gly Asp 965 970 975		
Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Pro 980 985 990		
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Arg Pro Trp Pro Arg Glu Ser Gly Arg Thr Arg Arg Ala Gly Val Ser 1060 1065 1070		
Ser Phe Gly Leu Thr Gly Thr Asn Ala His Val Ile Leu Glu Glu Ala 1075 1080 1085		
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Ala Ala Pro Trp Val Leu Ser Ala Arg Ser Arg Ala Ala Leu Arg Ala 1125 1130 1135		
Gln Ala Leu Arg Leu Ala Asp Gln Val Ala Ala Asp Pro Gly Leu Arg 1140 1145 1150		
Ala Gln Asp Val Ala His Ala Leu Ala Thr Ser Arg Thr Leu His Arg 1155 1160 1165		
His Arg Ala Val Val Ser Gly Ser Asp Arg Ala Gln Met Leu Ala Ala 1170 1175 1180		
Ala Lys Arg Phe Gly Leu Gly Glu Arg Thr Ala Gly Val Thr Pro Asp 1185 1190 1195 1200		
Asp Ser Ala Pro Gly Leu Leu Ala Phe Val Phe Ser Gly Gln Gly Ser 1205 1210 1215		
Gln Arg Ser Gly Met Gly Arg Ala Ala Ala Glu Ala Phe Pro Val Phe 1220 1225 1230		
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Ala Arg Leu Asp Asp Thr Thr Tyr Thr Gln Pro Ala Leu Phe Ala Val 1265 1270 1275 1280		
Gln Val Ala Leu Tyr Arg Leu Phe Glu Ser Trp Gly Val Val Pro Asp 1285 1290 1295		
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Tyr Ala Ala Pro Ala Val Pro Leu Val Ser Thr Val Thr Gly Arg Pro 1425 1430 1435 1440		
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Met Ile Asp Glu Cys Leu Glu Ser Ala Asp Gly Gln Pro Gly Thr Ala 1490 1495 1500		
Leu Val Pro Ser Leu Arg Ala Gly Val Pro Glu Arg Asp Ala Leu Leu 1505 1510 1515 1520		
Thr Ala Val Ala Arg Val His Ala Gln Gly Val Pro Val Asp Trp Asp 1525 1530 1535		
Ala Val Leu Pro Gly Ala Glu Ala Ser Val Thr Val Arg Gly Leu Pro 1540 1545 1550		
Ala Ala Asp Arg Gln Trp Phe Arg Phe Val Pro Asp Gln Gly Ala Pro 1555 1560 1565		
Leu Thr Leu Ala Asp Arg Ser Leu His Leu Glu Gly Ala Ala His Leu 1570 1575 1580		
Arg Asp Val Gly Gly Cys Arg Thr Ala Asp Gly Arg Trp Val Lys Met 1585 1590 1595 1600		
Gly Val Leu Tyr Arg Thr Asn Asn Leu His Ala Leu Thr Asp Ala Asp		

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Leu Ala Lys Leu Gln Arg Leu Gly Ile Arg Thr Asp Phe Asp Leu Arg		
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Met Pro Gly Glu Arg Ala Lys Ala Pro Asn Arg Val Pro Thr Gly Ala		
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Arg Tyr Ile Val Ala Asp Ala Phe Asp Ala His Leu Arg Asp Gly Leu		
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Leu Arg Leu Pro Ala Thr Leu Val Tyr Asp Tyr Pro Thr Pro Lys Ala		
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Val Val Arg Leu Val Arg Glu Arg Leu Ala Arg Pro Ala Ser Pro Ala		
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Gly Ala Glu Val Ser Glu Glu Thr Ala Ala Arg Leu Lys Ala Val Thr		
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Arg Glu Pro Leu Ala Ile Val Ser Met Ala Cys Arg Phe Pro Gly Gly	
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Val Arg Ser Pro Glu Glu Leu Trp Glu Leu Leu Arg Asp Gly Val Asp	
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Ala Val Ser Ser Phe Pro Arg Asn Arg Gly Trp Asp Leu Asp Ala Leu	
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Tyr His Ser Asp Pro Ala His Gln Gly Thr Ser Tyr Ala Arg Glu Gly	
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Gly Phe Leu His Asp Ala Gly Glu Phe Asp Pro Gly Phe Phe Gly Ile	
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Tyr Asp Ala Glu Gly Arg Arg Arg Ala Asp Glu Val Gly Gly His Leu	
165 170 175	
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Leu Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala Cys Ser Ser	
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Ser Leu Val Ala Leu His Leu Ala Met His Ala Leu Arg Arg Asp Glu	
210 215 220	

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Cys Ala Met Ala Leu Val Gly Gly Ala Thr Val Met Ser Thr Pro Gln	
225 230 235 240	
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Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg	
245 250 255	
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Cys Lys Pro Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly	
260 265 270	
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Val Gly Leu Leu Leu Val Glu Arg Leu Ser Asp Ala Val Arg Asn Gly	
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Tyr Pro Val Leu Ala Val Leu Lys Gly Ser Ala Val Asn Gln Asp Gly	
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Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val	
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Ile Arg Gln Ala Leu Thr Gly Ala Gly Leu Ala Ala Ser Asp Ile Asp	
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Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ala Pro Ala His Glu	
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465 470 475 480	
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Ile Leu Ser Ala Arg Thr Glu Ala Gly Leu Arg Ala Gln Ala Asp Arg	
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Leu Gly Arg His Leu Arg Asp Arg Ala Asp Leu Glu Pro Ala Ala Val	
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gcc cat gcg ctc gcg gac acc cgg acc ctc atg gaa cac cgc gcg gta	1584
Ala His Ala Leu Ala Asp Thr Arg Thr Leu Met Glu His Arg Ala Val	
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Val Val Ala Gly Asp Arg Glu Glu Phe Leu Arg Gly Leu Asp Ala Leu	
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Ala Ala Gly Arg Thr Ala Asn Gly Leu Val Ser Gly Val Ala Val Lys	
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Ala Ala Ser Ala Phe Leu Phe Ala Gly Gln Gly Ser Gln Arg Pro Gly	
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Met Gly Arg Glu Leu His Ala Ala His Pro Val Phe Ala Thr Ala Phe	
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Asp Ala Val Cys Ala Glu Leu Asp Pro His Leu Asp Arg Pro Leu Arg	
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Asp Ile Val Phe Ala Glu Glu Gly Ser Ala Glu Ala Ala Leu Leu Asp	
610 615 620	
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Gln Thr Ala Tyr Thr Gln Ala Ala Leu Phe Ala Leu Glu Thr Ala Leu	
625 630 635 640	
ttc cgg ctc gtc gaa tcc tgg ggc gtg gca ccc cgg ttc gtc gcc gga	1968
Phe Arg Leu Val Glu Ser Trp Gly Val Ala Pro Arg Phe Val Ala Gly	
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His Ser Ile Gly Glu Leu Thr Ala Ala His Val Ser Gly Val Leu Thr	
660 665 670	
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Leu His Asp Ala Ala Arg Leu Val Ala Ala Arg Gly Thr Leu Met Gln	

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Val Thr Glu Ile Ala Ala His Trp Glu Ala Gln	Gly Arg Arg Thr Lys		
	740 745 750		
cgg ctg cgg gtc agc cac gcc ttc cac tcc ccg	cac atg gac gac atg	2304	
Arg Leu Arg Val Ser His Ala Phe His Ser Pro	His Met Asp Asp Met		
	755 760 765		
ctg gag gac ttc cgg cgc gtc gcc cgc ggt ctg	acc ttc cac gcc ccc	2352	
Leu Glu Asp Phe Arg Arg Val Ala Arg Gly Leu	Thr Phe His Ala Pro		
	770 775 780		
cgc atc ccc gtg gtg tcc acg gtg acc ggc gcg	ctc gcc acc gaa gac	2400	
Arg Ile Pro Val Val Ser Thr Val Thr Gly Ala	Leu Ala Thr Glu Asp		
	785 790 795 800		
gaa ctg cgc tcg ccc gac tac tgg gtg cgg cag	gtc cgc gaa acc gtc	2448	
Glu Leu Arg Ser Pro Asp Tyr Trp Val Arg Gln	Val Arg Glu Thr Val		
	805 810 815		
cgc ttc tgt gct gcc gtg cgc acc ctt gag gcc	gag ggc gtc acc acc	2496	
Arg Phe Cys Ala Ala Val Arg Thr Leu Glu Ala	Glu Gly Val Thr Thr		
	820 825 830		
ttc gtg gag atc ggc acc ggc ggc gtc ctc acc	ccc atg gtc cag gac	2544	
Phe Val Glu Ile Gly Thr Gly Gly Val Leu Thr	Pro Met Val Gln Asp		
	835 840 845		
tgt ctg acc acc ctc gaa gag ccc gtt ctc gtc	cct ctg ctg cgc acc	2592	
Cys Leu Thr Thr Leu Glu Glu Pro Val Leu Val	Pro Leu Leu Arg Thr		
	850 855 860		
ggc cgc ccc gaa acc gtc gct ctc acc gag ggc	gtc gcc acc gcc ttc	2640	
Gly Arg Pro Glu Thr Val Ala Leu Thr Glu Gly	Val Ala Thr Ala Phe		
	865 870 875 880		
gtg cac ggt gtc ccc gtc gac cgg tcc gcc ttc	ccg ggc gcg ccc ggt	2688	
Val His Gly Val Pro Val Asp Arg Ser Ala Phe	Pro Gly Ala Pro Gly		
	885 890 895		
acc tcc cgc gcg gac ctg ccc acc tac gcc ttc	cag cgt cag tgg tac	2736	
Thr Ser Arg Ala Asp Leu Pro Thr Tyr Ala Phe	Gln Arg Gln Trp Tyr		
	900 905 910		

tgg ctg gac ccg gcc gac cac gac gag ggg gag gcg gcc gcc gcc gaa	2784
Trp Leu Asp Pro Ala Asp His Asp Glu Gly Glu Ala Ala Ala Ala Glu	
915 920 925	
gcg ggc gag gcc gga ttc tgg gcg gcc gtc gaa cgc gag gac ctc cag	2832
Ala Gly Glu Ala Gly Phe Trp Ala Ala Val Glu Arg Glu Asp Leu Gln	
930 935 940	
gag ctg tcg gcc gtc ctg gcc atc gac ggc agc gaa gcg gac tcc ctc	2880
Glu Leu Ser Ala Val Leu Ala Ile Asp Gly Ser Glu Ala Asp Ser Leu	
945 950 955 960	
ggc agc ttc ctg ccc acc ctc tcc tcc tgg cgc agg cag cgc agg acc	2928
Gly Ser Phe Leu Pro Thr Leu Ser Ser Trp Arg Arg Gln Arg Arg Thr	
965 970 975	
cag gcc gcc gcg gac cgc ttc agc tac cgc acc cac tgg gcc ccg cgc	2976
Gln Ala Ala Ala Asp Arg Phe Ser Tyr Arg Thr His Trp Ala Pro Arg	
980 985 990	
acc gcc tcg ggc ggc ccc acc gcc acc ggg cac tgg ctc gtc gtc ctg	3024
Thr Ala Ser Gly Gly Pro Thr Ala Thr Gly His Trp Leu Val Val Leu	
995 1000 1005	
ccc gaa ggc ggc acc gac gac ccg tgg acc gcc cgc ctc ctg gac gcg	3072
Pro Glu Gly Gly Thr Asp Asp Pro Trp Thr Ala Arg Leu Leu Asp Ala	
1010 1015 1020	
ctg aac gac cag ggc ctg cac acc gac gta cgc gaa ctg ccc gcc gac	3120
Leu Asn Asp Gln Gly Leu His Thr Asp Val Arg Glu Leu Pro Ala Asp	
1025 1030 1035 1040	
cac gag ccc gac gcc tgg ggc cga cac ccc gtg gac ggc gtg ctc tgt	3168
His Glu Pro Asp Ala Trp Gly Arg His Pro Val Asp Gly Val Leu Cys	
1045 1050 1055	
ctg ctg gca ctc gac gag cgg ccc acc cgc tcc tgc cct ccg tac cgg	3216
Leu Leu Ala Leu Asp Glu Arg Pro Thr Arg Ser Cys Pro Pro Tyr Arg	
1060 1065 1070	
cgc ggg ctg gcc gcc acc acc aac gct gct gcg cgc cct gag ggc gcg	3264
Arg Gly Leu Ala Ala Thr Thr Asn Ala Ala Ala Arg Pro Glu Gly Ala	
1075 1080 1085	
ggc atc cag gca ccg ctg tgg tgc gtg acc cgc ggc gcc gtc gcc gtc	3312
Gly Ile Gln Ala Pro Leu Trp Cys Val Thr Arg Gly Ala Val Ala Val	
1090 1095 1100	
gac cgg cac gag gcg ctc aag agc ccc tta cag gca cag aca tgg ggc	3360
Asp Arg His Glu Ala Leu Lys Ser Pro Leu Gln Ala Gln Thr Trp Gly	
1105 1110 1115 1120	
ctg ggc cgg gtg gcc gcc ctg gag tcc ccg cag agc tgg ggc ggg ctc	3408
Leu Gly Arg Val Ala Ala Leu Glu Ser Pro Gln Ser Trp Gly Gly Leu	
1125 1130 1135	

atc gac ctg ccc gac aac ctg gac gga cgg gcc gtc tcc gcg ctg ctg	3456
Ile Asp Leu Pro Asp Asn Leu Asp Gly Arg Ala Val Ser Ala Leu Leu	
1140 1145 1150	
agc acc ctc gcc ggg gag gag gac cag gtc gcc gtc cgc ccc gcc ggg	3504
Ser Thr Leu Ala Gly Glu Glu Asp Gln Val Ala Val Arg Pro Ala Gly	
1155 1160 1165	
gtc ttc gcc cgc cgc ctg gaa cgg atc aca ccc ggc ggc gac acc ggc	3552
Val Phe Ala Arg Arg Leu Glu Arg Ile Thr Pro Gly Gly Asp Thr Gly	
1170 1175 1180	
gac cgg tgg agc acc cac ggc acc gtc ctg gtc acc ggc ggc acc ggt	3600
Asp Arg Trp Ser Thr His Gly Thr Val Leu Val Thr Gly Gly Thr Gly	
1185 1190 1195 1200	
gcc ctc ggc gcg cac ctc gcc cac tgg ctg gcc gac gcc gga gcc gaa	3648
Ala Leu Gly Ala His Leu Ala His Trp Leu Ala Asp Ala Gly Ala Glu	
1205 1210 1215	
cac ctc gtg ctc acc ggc cgc cgc ggc ccg cag gcc ccc ggc gca ccg	3696
His Leu Val Leu Thr Gly Arg Arg Gly Pro Gln Ala Pro Gly Ala Pro	
1220 1225 1230	
gaa ctc gcg gcc gcc ctc acc gac cgg ggc gtc aag gtc acc ctc gcc	3744
Glu Leu Ala Ala Ala Leu Thr Asp Arg Gly Val Lys Val Thr Leu Ala	
1235 1240 1245	
gcc tgc gac gcc gcc gac cgt gat gcg ctg gcg gcc gtc ctc gcg gac	3792
Ala Cys Asp Ala Ala Asp Arg Asp Ala Leu Ala Val Leu Ala Asp	
1250 1255 1260	
atc ccg ccg cac ctg ccg ctg acc ggc gtc gtc cac gcc gcg ggc gta	3840
Ile Pro Pro His Leu Pro Leu Thr Gly Val Val His Ala Ala Gly Val	
1265 1270 1275 1280	
ctg gac gac ggc gta ctg gac gcg ctc acc ccc gag cgc ttc gag acc	3888
Leu Asp Asp Gly Val Leu Asp Ala Leu Thr Pro Glu Arg Phe Glu Thr	
1285 1290 1295	
gta ctg cgc ccc aag gcg cgg gcc gca cag aac ctg cac gaa ctc acc	3936
Val Leu Arg Pro Lys Ala Arg Ala Ala Gln Asn Leu His Glu Leu Thr	
1300 1305 1310	
cag gac ctc gac ctg gac cac ttc gtg ctg ttc tcc tcg atc gtc ggc	3984
Gln Asp Leu Asp Leu Asp His Phe Val Leu Phe Ser Ser Ile Val Gly	
1315 1320 1325	
gtc ctg ggc aac gcc gga cag gcc aac tac gcc gcc gcc aac gcc tac	4032
Val Leu Gly Asn Ala Gly Gln Ala Asn Tyr Ala Ala Ala Asn Ala Tyr	
1330 1335 1340	
ttg gac gcc ctc gcc gaa cac cgt ctc gcc cag ggg ctc ccg gcc acc	4080
Leu Asp Ala Leu Ala Glu His Arg Leu Ala Gln Gly Leu Pro Ala Thr	
1345 1350 1355 1360	
tcc gtg tcc tgg ggc cct ggg cag gcg gcg gca tgg cac gac agc gac	4128

Ser Val Ser Trp Gly Pro Gly Gln Ala Ala Ala Trp His Asp Ser Asp	
1365 1370 1375	
gcc gcc gac cgg atg agc cgc gac gga ctg ctg ccc atg gcc gcg gcc	4176
Ala Ala Asp Arg Met Ser Arg Asp Gly Leu Leu Pro Met Ala Ala Ala	
1380 1385 1390	
ccg cgt cgc cgc cct gcg cca gcc ctc gcc cag ggc atg aca cag gtg	4224
Pro Arg Arg Arg Pro Ala Pro Ala Leu Ala Gln Gly Met Thr Gln Val	
1395 1400 1405	
acc gtg gcc gac atc gac tgg agc gca tac gcc ccc gcc ctg acc gcc	4272
Thr Val Ala Asp Ile Asp Trp Ser Ala Tyr Ala Pro Ala Leu Thr Ala	
1410 1415 1420	
gtc cgc ccc agc ccc ctc atc ggc gac ctg ccc gag gca cgc cgc gcg	4320
Val Arg Pro Ser Pro Leu Ile Gly Asp Leu Pro Glu Ala Arg Arg Ala	
1425 1430 1435 1440	
ctc ggc ccc gca gaa ggc ccc cgc cgg gaa cgc tcc ccc ctg cgc gac	4368
Leu Gly Pro Ala Glu Gly Pro Arg Arg Glu Arg Ser Pro Leu Arg Asp	
1445 1450 1455	
cgg atc ggc gca ctg ccg ccc gcc gaa cag gaa aag gca ttc ctg acc	4416
Arg Ile Gly Ala Leu Pro Pro Ala Glu Gln Glu Lys Ala Phe Leu Thr	
1460 1465 1470	
atg gtc agg gaa gag gcc gcg agg gta ctg gga cac ccc tcg ccg gac	4464
Met Val Arg Glu Glu Ala Ala Arg Val Leu Gly His Pro Ser Pro Asp	
1475 1480 1485	
acc gtc gat gcc caa cgc gcc ttc cgc gag cag ggg ttc gac tcc ctg	4512
Thr Val Asp Ala Gln Arg Ala Phe Arg Glu Gln Gly Phe Asp Ser Leu	
1490 1495 1500	
atg gcc gtc gac ctg cgc aac cgg ctc tcc gcc gcg acg ggc ctg cgg	4560
Met Ala Val Asp Leu Arg Asn Arg Leu Ser Ala Ala Thr Gly Leu Arg	
1505 1510 1515 1520	
ctg ccc gcc acc ctg ctg ttc gac cac ccc acc ccc ctt gcg gcc gcc	4608
Leu Pro Ala Thr Leu Leu Phe Asp His Pro Thr Pro Leu Ala Ala Ala	
1525 1530 1535	
gcc tgc ctg cgc tcc gaa gtc ctg ggc gcc gca gga ccc gcc acg gtc	4656
Ala Cys Leu Arg Ser Glu Val Leu Gly Ala Ala Gly Pro Ala Thr Val	
1540 1545 1550	
gtt cag gca tcg acc gcc gcc ctc gac gaa ccg gtg gcg atc atc ggc	4704
Val Gln Ala Ser Thr Ala Ala Leu Asp Glu Pro Val Ala Ile Ile Gly	
1555 1560 1565	
atg gcc tgc cgc ttc ccc ggc ggc gtg cac tca ccc gag gcc ctg tgg	4752
Met Ala Cys Arg Phe Pro Gly Gly Val His Ser Pro Glu Ala Leu Trp	
1570 1575 1580	
cgg ctg ctg gcc gag ggc ggc gac gcc atc acc ccc atg ccc gcc gac	4800
Arg Leu Leu Ala Glu Gly Gly Asp Ala Ile Thr Pro Met Pro Ala Asp	

1585	1590	1595	1600	
cgg ggc tgg gac ctg gac cgg ctc tac cac ccc gac ccc gac cac cag				4848
Arg Gly Trp Asp Leu Asp Arg Leu Tyr His Pro Asp Pro Asp His Gln				
1605		1610	1615	
ggc acc agc tac gcc cgc ggc ggc ggc ttc ctg gac ggc gcg gcc gac				4896
Gly Thr Ser Tyr Ala Arg Gly Gly Gly Phe Leu Asp Gly Ala Ala Asp				
1620		1625	1630	
ttc gac gcg gac ttc ttc ggc atc tcg ccg cgc gag gcc ctc gcc atg				4944
Phe Asp Ala Asp Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met				
1635		1640	1645	
gac ccg cag cag cgg ctg ctc ctg gaa aca tgg gag gtg ctc gaa cag				4992
Asp Pro Gln Gln Arg Leu Leu Leu Glu Thr Trp Glu Val Leu Glu Gln				
1650		1655	1660	
gcg ggg atc gac ccg gaa tcc ctg cgg ggc agc agc acc ggt gtc ttc				5040
Ala Gly Ile Asp Pro Glu Ser Leu Arg Gly Ser Ser Thr Gly Val Phe				
1665		1670	1675	1680
gcg ggc acc aac acc cag gac tac ggc acg gcc ctg gac gcg gca cag				5088
Ala Gly Thr Asn Thr Gln Asp Tyr Gly Thr Ala Leu Asp Ala Ala Gln				
1685		1690	1695	
gac gaa gcc ggc gga cac cgg ctc acc ggc aac gcg atg agc gtc gtc				5136
Asp Glu Ala Gly Gly His Arg Leu Thr Gly Asn Ala Met Ser Val Val				
1700		1705	1710	
tcc ggc cgg gtc tcc tac acc ttc ggc ttc gag gga ccg gcc ctc acc				5184
Ser Gly Arg Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Leu Thr				
1715		1720	1725	
gtg gac acg gcg tgc tcc tcc tcg ctg gtg gcc ctg cac atg gcc gcg				5232
Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Met Ala Ala				
1730		1735	1740	
cag gcg ctg cgc cag ggc gaa tgc tcc ctg gcg gtc gcg ggc ggt gtg				5280
Gln Ala Leu Arg Gln Gly Glu Cys Ser Leu Ala Val Ala Gly Gly Val				
1745		1750	1755	1760
acg gtg atg gcc acc ccg tcc tcc ttc gtg gag ttc gcc cgg cag cgc				5328
Thr Val Met Ala Thr Pro Ser Ser Phe Val Glu Phe Ala Arg Gln Arg				
1765		1770	1775	
ggg ctg gcc ccc gac ggc cgc tgc aag ccg ttc gcg gcg gcc gcc gac				5376
Gly Leu Ala Pro Asp Gly Arg Cys Lys Pro Phe Ala Ala Ala Asp				
1780		1785	1790	
ggc acc ggc tgg agc gag ggc gtc ggc ctg ctg ctc gtg gaa cgg ctc				5424
Gly Thr Gly Trp Ser Glu Gly Val Gly Leu Leu Leu Val Glu Arg Leu				
1795		1800	1805	
agc gac gcc cgc cga aac ggc cac cag gtg ctc gcc gtc gtc cgc ggt				5472
Ser Asp Ala Arg Arg Asn Gly His Gln Val Leu Ala Val Val Arg Gly				
1810		1815	1820	

gac gcc gcg tac acg ctg atg acg cac cgc acg gcc ttc gcc cac cgc Asp Ala Ala Tyr Thr Leu Met Thr His Arg Thr Ala Phe Ala His Arg 2050 2055 2060	6192
gcg gcc gtc cgc gcc gcc gac cac gaa gcc gcg ctg cgc gcc ctg acc Ala Ala Val Arg Ala Ala Asp His Glu Ala Ala Leu Arg Ala Leu Thr 2065 2070 2075 2080	6240
gcc ctg gct gcg ggc gag gcc gac ccc gcc gtg gac acc ggc acc gcc Ala Leu Ala Ala Gly Glu Ala Asp Pro Ala Val Asp Thr Gly Thr Ala 2085 2090 2095	6288
cac acc ggc cgg gac gcc gtc ctc ttc tcc ggc cag gga tcg caa cgc His Thr Gly Arg Asp Ala Val Leu Phe Ser Gly Gln Gly Ser Gln Arg 2100 2105 2110	6336
atc gga atg ggc cgg gag ttg tcc ggc cgc tac ccg gtg ttc gca gag Ile Gly Met Gly Arg Glu Leu Ser Gly Arg Tyr Pro Val Phe Ala Glu 2115 2120 2125	6384
gcc ttc gac acc gtg tgc gcg gcc ttg gac gag cat ctg gac cgc ccc Ala Phe Asp Thr Val Cys Ala Ala Leu Asp Glu His Leu Asp Arg Pro 2130 2135 2140	6432
ctg cgg gac gtg gtc cgg ggc gag gac gag gag ctg ctg aac cgg acc Leu Arg Asp Val Val Arg Gly Glu Asp Glu Glu Leu Leu Asn Arg Thr 2145 2150 2155 2160	6480
gtc tac gcc cag gcg ggg ctg ttc gcc atc gag gtg gcc ctc ttc cgg Val Tyr Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg 2165 2170 2175	6528
ctc gtg gag tcc tgg ggc gta cgg ccg cac tac gtg gcc ggg cat tcc Leu Val Glu Ser Trp Gly Val Arg Pro His Tyr Val Ala Gly His Ser 2180 2185 2190	6576
gtc ggc gag atc gcc gcc gcg cac gtc gcc ggg gtg ttc tcg ctg gcc Val Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Phe Ser Leu Ala 2195 2200 2205	6624
gat gcc tgc gcg ctg gtg gcg gca cgc gga cgg ctg atg cag gcg ctg Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Ala Leu 2210 2215 2220	6672
ccc gcc ggc ggc gcg atg gcg gcg atc cgg gcg acg gag gac gaa gtc Pro Ala Gly Gly Ala Met Ala Ala Ile Arg Ala Thr Glu Asp Glu Val 2225 2230 2235 2240	6720
ctc ccg cac ctg gcg gac agc gtc tcg atc gcg gcc gtc aac ggc ccg Leu Pro His Leu Ala Asp Ser Val Ser Ile Ala Ala Val Asn Gly Pro 2245 2250 2255	6768
tcg tcg gtc gtc gtc tcc ggc gcc gag cac gcc gtg ctc tcc atc gcc Ser Ser Val Val Val Ser Gly Ala Glu His Ala Val Leu Ser Ile Ala 2260 2265 2270	6816
gcg cac ttc gag ggc gcg ggc cgc aag acc acc agg ctg cgg gtc tcg	6864

Ala His Phe Glu Gly Ala Gly Arg Lys Thr Thr Arg Leu Arg Val Ser	
2275 2280 2285	
cac gcc ttc cac tcc ccg ctc atg gac ccg atg ctg gcc gac ttc cgc	6912
His Ala Phe His Ser Pro Leu Met Asp Pro Met Leu Ala Asp Phe Arg	
2290 2295 2300	
gcc gtc gcc gag ggc ctg acc tac ggc gag ccg gag ctg gcc gtc gta	6960
Ala Val Ala Glu Gly Leu Thr Tyr Gly Glu Pro Glu Leu Ala Val Val	
2305 2310 2315 2320	
tcg aac gtc acc ggc caa ctc gcc acc ccg gac cag ctg cgc acc ccc	7008
Ser Asn Val Thr Gly Gln Leu Ala Thr Pro Asp Gln Leu Arg Thr Pro	
2325 2330 2335	
gag tac tgg gtg acc cat gtc cgc gcg gcg gtg cgc ttc gcg gac ggg	7056
Glu Tyr Trp Val Thr His Val Arg Ala Ala Val Arg Phe Ala Asp Gly	
2340 2345 2350	
ata cgg gct ctg ggg gcg gaa ggg gtg acg ccg ttc ctc gaa ctc ggc	7104
Ile Arg Ala Leu Gly Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly	
2355 2360 2365	
ccg gac ggc gtc ctg tcg gcc ttg gcc agg gag tcg gca ccg gac gac	7152
Pro Asp Gly Val Leu Ser Ala Leu Ala Arg Glu Ser Ala Pro Asp Asp	
2370 2375 2380	
gcc gtg tgc act ccc gtg ctg cgc aag gac cgc tcc gag gcg gcg acc	7200
Ala Val Cys Thr Pro Val Leu Arg Lys Asp Arg Ser Glu Ala Ala Thr	
2385 2390 2395 2400	
ctc ctc gcg gcc ctg acg cac ctg cac gta cac gga acc gag atc gac	7248
Leu Leu Ala Ala Leu Thr His Leu His Val His Gly Thr Glu Ile Asp	
2405 2410 2415	
tgg acc gcg ttc ctc gcc ggc cgc gac gcg cac gcc gtc gac ctg ccc	7296
Trp Thr Ala Phe Leu Ala Gly Arg Asp Ala His Ala Val Asp Leu Pro	
2420 2425 2430	
acg tac gcc ttc cag cac cag ccg ttc tgg ccg acc ccc gac cac acc	7344
Thr Tyr Ala Phe Gln His Gln Arg Phe Trp Pro Thr Pro Asp His Thr	
2435 2440 2445	
cgc acc ggt gac ctg ggc gcc gtc ggc ctc gaa gcg acc ggg cac ccg	7392
Arg Thr Gly Asp Leu Gly Ala Val Gly Leu Glu Ala Thr Gly His Pro	
2450 2455 2460	
ctg ctg agc gcc gcc gtg gaa ctg ccg gac ggt gag ggc ctg ttg ttc	7440
Leu Leu Ser Ala Ala Val Glu Leu Pro Asp Gly Glu Gly Leu Leu Phe	
2465 2470 2475 2480	
acc acc cgc ctc tcg ctc cag acc cac ccc tgg ctg gcc ggg cac gtc	7488
Thr Thr Arg Leu Ser Leu Gln Thr His Pro Trp Leu Ala Gly His Val	
2485 2490 2495	
gtc atg ggc tcg gtc ctg ctg ccg ggg acg gcc ttc gcc gaa ctc gcc	7536
Val Met Gly Ser Val Leu Leu Pro Gly Thr Ala Phe Ala Glu Leu Ala	

2500	2505	2510	
ctc cgc gcc gcc gac gag gtg ggc tgc gac cgc gtc gac gaa ctg acc Leu Arg Ala Ala Asp Glu Val Gly Cys Asp Arg Val Asp Glu Leu Thr 2515 2520 2525			7584
ctg gcc gcc ccg ctc gtc ctg ccc gag cac ggc ggc gta cag ctc cag Leu Ala Ala Pro Leu Val Leu Pro Glu His Gly Gly Val Gln Leu Gln 2530 2535 2540			7632
ctg cgg gtg ggc ccc gcc gac gcg tcc ggc cgc cgc acc ctg acc gcc Leu Arg Val Gly Pro Ala Asp Ala Ser Gly Arg Arg Thr Leu Thr Ala 2545 2550 2555 2560			7680
cgc tcc agg gcg gag ggc gac ggc gac cgc ccg tgg gtc cag cac gcc Arg Ser Arg Ala Glu Gly Asp Gly Asp Arg Pro Trp Val Gln His Ala 2565 2570 2575			7728
acc ggc gtc ctc gcg gaa ggg gag tgc acg ccc gaa ccc ggc tac gac Thr Gly Val Leu Ala Glu Gly Glu Ser Thr Pro Glu Pro Gly Tyr Asp 2580 2585 2590			7776
ttc cac acc gag tcc tgg ccg ccc gcc gac gcc gcg ccc gtc gaa ctg Phe His Thr Glu Ser Trp Pro Pro Ala Asp Ala Ala Pro Val Glu Leu 2595 2600 2605			7824
tcc ggc ctc tac ccg gac ttc gcc gca cac ggt ttc gac tac ggt ccc Ser Gly Leu Tyr Pro Asp Phe Ala Ala His Gly Phe Asp Tyr Gly Pro 2610 2615 2620			7872
cac ttc cag ggg ctg ccg acc gcc tgg cgc cga ggc gac gag gtg ttc His Phe Gln Gly Leu Arg Thr Ala Trp Arg Arg Gly Asp Glu Val Phe 2625 2630 2635 2640			7920
gcc gag gtc gcc ctg ccc gcc gag gcc gaa ggc gag gca tcc gcg tac Ala Glu Val Ala Leu Pro Ala Glu Ala Glu Gly Glu Ala Ser Ala Tyr 2645 2650 2655			7968
gga ctc cat ccg gcg ctg ctc gac gcc gcc ctg cac gtc gtc gcg ttc Gly Leu His Pro Ala Leu Leu Asp Ala Ala Leu His Val Val Ala Phe 2660 2665 2670			8016
aac gga gtg gac cgc ggc gtc gtg ccg ttc tcc tgg gag agc gtc gcg Asn Gly Val Asp Arg Gly Val Val Pro Phe Ser Trp Glu Ser Val Ala 2675 2680 2685			8064
ctg cac gcc acc ggc gcc tgc gcc gta cgg atc cgg gtc gtc cgg cac Leu His Ala Thr Gly Ala Ser Ala Val Arg Ile Arg Val Val Arg His 2690 2695 2700			8112
agc ggc gac acg gtc tcc gtg gat gtc gcc gac acc acc ggc gag ccc Ser Gly Asp Thr Val Ser Val Asp Val Ala Asp Thr Thr Gly Glu Pro 2705 2710 2715 2720			8160
gtc gcc tcc atc ggc acg ctc gtc ctg cgg gcg gtc tcc gcc gac cag Val Ala Ser Ile Gly Thr Leu Val Leu Arg Ala Val Ser Ala Asp Gln 2725 2730 2735			8208

ttg gcg ggc ggc gcg gac ccg gcc gtc cgc gat gcg ctg ttc cgc gtg	8256
Leu Ala Gly Gly Ala Asp Pro Ala Val Arg Asp Ala Leu Phe Arg Val	
2740 2745 2750	
cag tgg aac ccc gta cgc ctg ccc ccg gcc ggg gcc gcg gtg acc gtg	8304
Gln Trp Asn Pro Val Arg Leu Pro Pro Ala Gly Ala Ala Val Thr Val	
2755 2760 2765	
gcg acg ctc ggc tcc ctt gcc ggc gca ccg ttc gac ggc tac ccg gac	8352
Ala Thr Leu Gly Ser Leu Ala Gly Ala Pro Phe Asp Gly Tyr Pro Asp	
2770 2775 2780	
ctg gcg tcc ctg gcc cgg tcc ggt cgt gtg gcg ggt gcg gtg ctg gta	8400
Leu Ala Ser Leu Ala Arg Ser Gly Arg Val Ala Gly Ala Val Leu Val	
2785 2790 2795 2800	
ccg gtg gaa gcc ggt gcc ggc gag gtg gtg gcg gac gat gtc gtg ggg	8448
Pro Val Glu Ala Gly Ala Gly Glu Val Val Ala Asp Asp Val Val Gly	
2805 2810 2815	
gcg acg cac gca acg gcc gcc cgg gcg ctg gac ctg gcc cgg tcg tgg	8496
Ala Thr His Ala Thr Ala Ala Arg Ala Leu Asp Leu Ala Arg Ser Trp	
2820 2825 2830	
ctg gcc gat gac cgg ttc gcg gcc tcg cgc ctg gtg ttc gtg acg cgt	8544
Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe Val Thr Arg	
2835 2840 2845	
ggc gcg gtg tcc ggt gcg gat ctc gcg ggt gcg gcg gtg tgg ggt ctg	8592
Gly Ala Val Ser Gly Ala Asp Leu Ala Gly Ala Ala Val Trp Gly Leu	
2850 2855 2860	
gtg cgg tcg gcg ctg tcg gag cac ccg ggc cgc ttc ggt ctg gtg gat	8640
Val Arg Ser Ala Leu Ser Glu His Pro Gly Arg Phe Gly Leu Val Asp	
2865 2870 2875 2880	
ctg gat gac gat gcc gaa ctg gcg ctg gtg cca cgg gtg ttg gcg tcg	8688
Leu Asp Asp Asp Ala Glu Leu Ala Leu Val Pro Arg Val Leu Ala Ser	
2885 2890 2895	
gat gag ccg cag ctg ctg gtg cgc ggt ggt gag gtg ctg gcg gcg cgg	8736
Asp Glu Pro Gln Leu Leu Val Arg Gly Gly Glu Val Leu Ala Ala Arg	
2900 2905 2910	
ctg gcc cgg gcg cag tcc tcg cac gcg gtg acc tgg gat ccg tcc ggc	8784
Leu Ala Arg Ala Gln Ser Ser His Ala Val Thr Trp Asp Pro Ser Gly	
2915 2920 2925	
acg gtg ctc gtc acc ggt ggc acg ggt ggt ctg ggc cgt gtg atg gca	8832
Thr Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Arg Val Met Ala	
2930 2935 2940	
cgt cac ttg gtg gtg gaa cac ggg gta cgg aac ctg ctg ctg gtc agc	8880
Arg His Leu Val Val Glu His Gly Val Arg Asn Leu Leu Leu Val Ser	
2945 2950 2955 2960	

cgc cgt ggg ccc gcc gcc gaa ggt gcc gaa gag ctg gtg acg gag ctc	8928
Arg Arg Gly Pro Ala Ala Glu Gly Ala Glu Glu Leu Val Thr Glu Leu	
2965 2970 2975	
cgg cac agc ggt gcc gaa gtg gcc gtc gaa gcc tgt gat gtc acc gac	8976
Arg His Ser Gly Ala Glu Val Ala Val Glu Ala Cys Asp Val Thr Asp	
2980 2985 2990	
gcg gcc gcc gtg gcc gac ctg gtg gcc cgg cac cgg atc agc gct gtg	9024
Ala Ala Ala Val Ala Asp Leu Val Ala Arg His Arg Ile Ser Ala Val	
2995 3000 3005	
gtg cat acg gcc ggt gtc ctg gat gac ggt gtg gtg gag tcg ctg aca	9072
Val His Thr Ala Gly Val Leu Asp Asp Gly Val Val Glu Ser Leu Thr	
3010 3015 3020	
ccg gag cgg ctg tcg gcg gtg ttg cgt ccg aag gtg gat gcg gcc tgg	9120
Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys Val Asp Ala Ala Trp	
3025 3030 3035 3040	
aac ctg cac gag gcg acc agg gat ctg gac ctg gac gcg ttc gtg gtc	9168
Asn Leu His Glu Ala Thr Arg Asp Leu Asp Leu Asp Ala Phe Val Val	
3045 3050 3055	
ttc tcc tca gtg gca ggc acg atc ggg agc ccc ggt cag gcc aac tac	9216
Phe Ser Ser Val Ala Gly Thr Ile Gly Ser Pro Gly Gln Ala Asn Tyr	
3060 3065 3070	
gcg gcg ggc aac gcc ttc ctg gat gcc ctg gcc cac cac cgt cgg gcg	9264
Ala Ala Gly Asn Ala Phe Leu Asp Ala Leu Ala His His Arg Arg Ala	
3075 3080 3085	
gcg ggt ctt ccg gcg gcg tcg ctg gca tgg ggc ccc tgg tcc cgg gac	9312
Ala Gly Leu Pro Ala Ala Ser Leu Ala Trp Gly Pro Trp Ser Arg Asp	
3090 3095 3100	
ggc ggc atg acc ggc acc ctg acc gac gtc gac tcc agc gca tcg ccc	9360
Gly Gly Met Thr Gly Thr Leu Thr Asp Val Asp Ser Ser Ala Ser Pro	
3105 3110 3115 3120	
ggc agg cat gcc cga act cac ccc cgc aca ggg cgt ggc ctc ttc gac	9408
Gly Arg His Ala Arg Thr His Pro Arg Thr Gly Arg Gly Leu Phe Asp	
3125 3130 3135	
gcc gcg ctg gcg gcc ggt gac gcc cac ctg ctc ccc gta cgc ttc gac	9456
Ala Ala Leu Ala Ala Gly Asp Ala His Leu Leu Pro Val Arg Phe Asp	
3140 3145 3150	
tgg gcg tcc ctg cgc gcc cag ggc gag gtg cca ccg ctg ttg cgc ggc	9504
Trp Ala Ser Leu Arg Ala Gln Gly Glu Val Pro Pro Leu Leu Arg Gly	
3155 3160 3165	
ctg atc agg acc cgt gcc cgg cgc tcg gcg gtc ggc ggc tcg gcc gcg	9552
Leu Ile Arg Thr Arg Ala Arg Arg Ser Ala Val Gly Gly Ser Ala Ala	
3170 3175 3180	
gca gcc ggc ctg gtg gga cgc ctg agc gga cgg gga acg gtg gag cgg	9600

Ala Ala Gly Leu Val Gly Arg Leu Ser Gly Arg Gly Thr Val Glu Arg	
3185 3190 3195 3200	
cgc gag gtg ctc ctg gac ctg gta cgg gcc cag atc gcg gtc gtc ctg	9648
Arg Glu Val Leu Leu Asp Leu Val Arg Ala Gln Ile Ala Val Val Leu	
3205 3210 3215	
ggc cac gcg aac ccg gag acg atc gag tcc acc cgt gtc ttc cag gac	9696
Gly His Ala Asn Pro Glu Thr Ile Glu Ser Thr Arg Val Phe Gln Asp	
3220 3225 3230	
ctc ggc ttc gac tcc ctg acc gcg gtc gaa ctc cgc aac cgc ctc aac	9744
Leu Gly Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn	
3235 3240 3245	
aac gcg acc ggc ctg cgc ctt tcg gcc acc gcc gtc ttc gac tac ccc	9792
Asn Ala Thr Gly Leu Arg Leu Ser Ala Thr Ala Val Phe Asp Tyr Pro	
3250 3255 3260	
acg gcg gac gcg ctc gtc gac ttc ctg ctg gac gag ctg ttc ggc gcg	9840
Thr Ala Asp Ala Leu Val Asp Phe Leu Leu Asp Glu Leu Phe Gly Ala	
3265 3270 3275 3280	
cag gag gag gcc gag ctg ccg gcg ccg gtg ccg tca ccg gcg ggg gcc	9888
Gln Glu Glu Ala Glu Leu Pro Ala Pro Val Pro Ser Pro Ala Gly Ala	
3285 3290 3295	
gcc gac gac ccg gtc gtg atc gtc ggc atg agc tgc cgc tac ccg ggc	9936
Ala Asp Asp Pro Val Val Ile Val Gly Met Ser Cys Arg Tyr Pro Gly	
3300 3305 3310	
ggc gtc ggc tcg ccc gag gac ctg tgg cgc ctg gtg tcg gag ggc gtg	9984
Gly Val Gly Ser Pro Glu Asp Leu Trp Arg Leu Val Ser Glu Gly Val	
3315 3320 3325	
gac gcg gtg tcc gac ttc ccc acc gac cgt gga tgg gac gtg gag agc	10032
Asp Ala Val Ser Asp Phe Pro Thr Asp Arg Gly Trp Asp Val Glu Ser	
3330 3335 3340	
ctc tac agc ccc gac ccc gag gcg ctc ggc acc tcg tac acc cgc tcc	10080
Leu Tyr Ser Pro Asp Pro Glu Ala Leu Gly Thr Ser Tyr Thr Arg Ser	
3345 3350 3355 3360	
ggt gga ttc ctc cac gag gcg gcg gag ttc gac ccc gat ttc ttc ggg	10128
Gly Gly Phe Leu His Glu Ala Ala Glu Phe Asp Pro Asp Phe Phe Gly	
3365 3370 3375	
atg agc ccg cgc gag gcg ctg gcg acc gac gcc cag cag cgg ctg ctg	10176
Met Ser Pro Arg Glu Ala Leu Ala Thr Asp Ala Gln Gln Arg Leu Leu	
3380 3385 3390	
ctg gag acg acc tgg gag gcc atc gag cgc acg ggc atc gac ccg gcg	10224
Leu Glu Thr Thr Trp Glu Ala Ile Glu Arg Thr Gly Ile Asp Pro Ala	
3395 3400 3405	
tcg ctg cgg ggc agc cgt acg ggc gtc ttc gcg ggc gtg atg tac acc	10272
Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Val Met Tyr Thr	

3410	3415	3420	
gac tac ggc gac ctc ctc gtc ggc gac cag ttc gag ggc tac cgc agc			10320
Asp Tyr Gly Asp Leu Leu Val Gly Asp Gln Phe Glu Gly Tyr Arg Ser			
3425	3430	3435	3440
aac ggc agc gcg gcc agc atc gcc tcc ggc cgg gtc tcg tac acc ttc			10368
Asn Gly Ser Ala Ala Ser Ile Ala Ser Gly Arg Val Ser Tyr Thr Phe			
	3445	3450	3455
ggt ttc gag ggt ccg gcg gtc acg gtg gac acg gca tgc tcg tcg tcc			10416
Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser			
	3460	3465	3470
ctg gtc gcc ctg cac tgg gcg gcg cag tcg ctg cgc tcg ggc gag tgc			10464
Leu Val Ala Leu His Trp Ala Ala Gln Ser Leu Arg Ser Gly Glu Cys			
	3475	3480	3485
tcg ctc gcg gtc gcg ggc ggt gtg acg gtg atg tcc aca ccg acg acg			10512
Ser Leu Ala Val Ala Gly Gly Val Thr Val Met Ser Thr Pro Thr Thr			
	3490	3495	3500
ttc gtc gag ttc tcg cgg caa cgc gga ctg tcg gcg gac ggc cgc tgc			10560
Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ser Ala Asp Gly Arg Cys			
3505	3510	3515	3520
aag gcg ttc gcc gat gcg gcc gac ggc gtc ggc tgg ggc gag ggc gtc			10608
Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly Trp Gly Glu Gly Val			
	3525	3530	3535
ggc atg ctc gta ctg gag cgt ctg tcg gac gcg cgc cgc aac ggg cac			10656
Gly Met Leu Val Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His			
	3540	3545	3550
cgg gtg ctc gcg gtg gtg cgc ggc agt gcg gtg aac cag gac ggt gcg			10704
Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala			
	3555	3560	3565
tcc aat ggt ctg acg gcg ccg aac ggc ccc gcc cag cag cgg gtg atc			10752
Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala Gln Gln Arg Val Ile			
	3570	3575	3580
cgg cag gcg ctg gcg agt gcg ggg ctg tcg gcg gcg gat gtg gac gcg			10800
Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala Ala Asp Val Asp Ala			
3585	3590	3595	3600
gtg gag gcg cac ggt acg ggt acg acg ctg ggc gat ccg atc gag gcc			10848
Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Ile Glu Ala			
	3605	3610	3615
cag gcg ctg ctc gcc acg tat ggc cag gag cga cct gag gac cgg ccg			10896
Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg Pro Glu Asp Arg Pro			
	3620	3625	3630
ttg ctg ctg ggg tcg gtc aaa tcc aac atc ggt cat gcg cag gcg gct			10944
Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly His Ala Gln Ala Ala			
	3635	3640	3645

tcg ggt gtg gcg ggt gtc atc aag atg gtg ctg gcg atg cgg cac ggt Ser Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His Gly 3650 3655 3660	10992
gtg ctg cct cgg acg ctg cat gtg gat gaa ccg tcg tcg cat gtc gac Val Leu Pro Arg Thr Leu His Val Asp Glu Pro Ser Ser His Val Asp 3665 3670 3675 3680	11040
tgg agt gcc ggt gcc gtc gag ctg ctg acc tcc gag gcc gag tgg ccg Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser Glu Ala Glu Trp Pro 3685 3690 3695	11088
cag ggc gag ggg ccg cgc cgc gcg ggc gtc tcc tcc ttc ggc gtc agc Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser 3700 3705 3710	11136
ggg acg aac gcg cat gtg atc ctg gag cag ccc gga ccg gac gcg gcc Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Gly Pro Asp Ala Ala 3715 3720 3725	11184
gac gcc gca ccg gac gcc acg gtg acc gat ccc ggc gcg ctg gca tgg Asp Ala Ala Pro Asp Ala Thr Val Thr Asp Pro Gly Ala Leu Ala Trp 3730 3735 3740	11232
gtg ctc tcc gca ccg aac gaa gcg gcc ctg cgc tgc cag gcg gcg cgc Val Leu Ser Ala Arg Asn Glu Ala Ala Leu Arg Cys Gln Ala Ala Arg 3745 3750 3755 3760	11280
ctg ctg tcc ctg gtc gcc ggc agt gac gcg ctg tgc gcg ccg gac atc Leu Leu Ser Leu Val Ala Gly Ser Asp Ala Leu Cys Ala Arg Asp Ile 3765 3770 3775	11328
ggc cac tcg ctg gtg acc ggg ccg tcg agc ttc gcc cac cgt gcg gtg Gly His Ser Leu Val Thr Gly Arg Ser Ser Phe Ala His Arg Ala Val 3780 3785 3790	11376
gtg tgg ggc cag gac cgc gac gca ctg gtg cgt gcc ctg tcc gca ctc Val Trp Gly Gln Asp Arg Asp Ala Leu Val Arg Ala Leu Ser Ala Leu 3795 3800 3805	11424
gcg gtg ggc gag gcc gac gcc ggt ctg gcg gag ggc gcg tcc ggc gcg Ala Val Gly Glu Ala Asp Ala Gly Leu Ala Glu Gly Ala Ser Gly Ala 3810 3815 3820	11472
ggg agg acg gcc ttc ctg ttc tcg ggc cag gga tca caa ccg ctg gga Gly Arg Thr Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg Leu Gly 3825 3830 3835 3840	11520
atg gga tgg gag ttg tac gct cgc tac ccg gtg ttc gcg gac gca ttc Met Gly Trp Glu Leu Tyr Ala Arg Tyr Pro Val Phe Ala Asp Ala Phe 3845 3850 3855	11568
gac gcc gtg tgc gcg gcc ttg gac gag cac ctg gag cgc ccc ctg ccg Asp Ala Val Cys Ala Ala Leu Asp Glu His Leu Glu Arg Pro Leu Arg 3860 3865 3870	11616

gac gtg gtc tgg ggc gag gac gcg gag ctg ctg aac cag acc gcg tac Asp Val Val Trp Gly Glu Asp Ala Glu Leu Leu Asn Gln Thr Ala Tyr 3875 3880 3885	11664
gcc cag gcc ggg ctg ttc gcg atc gag gtg gcg ctg tac cgg ctg gcg Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Tyr Arg Leu Ala 3890 3895 3900	11712
gaa tcg tgg ggc atg cgc ccg gac ttc gtg gcg ggg cat tcg atc ggt Glu Ser Trp Gly Met Arg Pro Asp Phe Val Ala Gly His Ser Ile Gly 3905 3910 3915 3920	11760
gag gtc gcc gcg gcc cat gtg tcg ggt gtc ttc tcg ctc ccg gat gcc Glu Val Ala Ala Ala His Val Ser Gly Val Phe Ser Leu Pro Asp Ala 3925 3930 3935	11808
tgt gcg ctg gtg gcg gcc cga ggc cga ctg atg cag caa ctg ccc tcc Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu Pro Ser 3940 3945 3950	11856
ggc ggc gcg atg atg gcg atc cgg gcg acc gag gac gag gtc ctt ccg Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val Leu Pro 3955 3960 3965	11904
cat ctg gcg gaa ggc gtc tcg ctc gcg gcg gtc aat ggc ccg tcg tcg His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro Ser Ser 3970 3975 3980	11952
gtc gtg atc tcg ggc gcc gag gac gcg gtg ctg gcc atc gcg gcg cac Val Val Ile Ser Gly Ala Glu Asp Ala Val Leu Ala Ile Ala Ala His 3985 3990 3995 4000	12000
ttc gcg ggg gag ggg cgc aaa acc acc cga ctg cgg gtc tcg cat gcc Phe Ala Gly Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser His Ala 4005 4010 4015	12048
ttc cac tcg ccg ctc atg gaa ccg atg ctg gag gaa ttc cgc gcg gtg Phe His Ser Pro Leu Met Glu Pro Met Leu Glu Glu Phe Arg Ala Val 4020 4025 4030	12096
gtg aca cgg ctg tcc ttc ggc acg ccg acg atc ccc gtc gtc tcc aac Val Thr Arg Leu Ser Phe Gly Thr Pro Thr Ile Pro Val Val Ser Asn 4035 4040 4045	12144
ctg acg ggc cgc ctc gcc gaa ccc gaa cag ctc gcg cac gcc gac tac Leu Thr Gly Arg Leu Ala Glu Pro Glu Gln Leu Ala His Ala Asp Tyr 4050 4055 4060	12192
tgg gtc cgg cac gtc cgc gag gca gtg cgc ttc gcg gac ggg ata cag Trp Val Arg His Val Arg Glu Ala Val Arg Phe Ala Asp Gly Ile Gln 4065 4070 4075 4080	12240
gcg ctg cgg gcg gaa ggg gtg acg cgg ttc ctg gag ctc ggc ccg gac Ala Leu Arg Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly Pro Asp 4085 4090 4095	12288
ggt gtg ctg tcg gcg atg gcc cgc gag tcg gca tcg gac gac gcc gtg	12336

Gly Val Leu Ser Ala Met Ala Arg Glu Ser Ala Ser Asp Asp Ala Val	
4100	4105 4110
ctc gcg ccc gta ctg cgc agg gac cgg ccc gag gag acg gcg ctg ctg	12384
Leu Ala Pro Val Leu Arg Arg Asp Arg Pro Glu Glu Thr Ala Leu Leu	
4115	4120 4125
ggc gcc ctg gcg cag ctg tac gtc cgg ggt gcg cac gtg gac tgg acg	12432
Gly Ala Leu Ala Gln Leu Tyr Val Arg Gly Ala His Val Asp Trp Thr	
4130	4135 4140
gtg ccg ttc gcc ggt tcg ggt gcg cgc tgg gcg gat ctg ccg acg tac	12480
Val Pro Phe Ala Gly Ser Gly Ala Arg Trp Ala Asp Leu Pro Thr Tyr	
4145	4150 4155 4160
gcg ttc cag cac gag cgg ttc tgg ccg tcg ggc ggt gtg gca cgt ccg	12528
Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Val Ala Arg Pro	
4165	4170 4175
ggc gat gtg cgg tcc gcg ggc ctg ggc tcg gcc ggg cat ccg ctg ctg	12576
Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro Leu Leu	
4180	4185 4190
ggc gcg gcg gtg gaa ctg gcg ggc tcg ggc ggc ctg ttg ttc acg ggc	12624
Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Leu Leu Phe Thr Gly	
4195	4200 4205
cgg ctg tcg gtg tcc tcg cac ccg tgg ctg gcg gac cat gtg gtg ctg	12672
Arg Leu Ser Val Ser Ser His Pro Trp Leu Ala Asp His Val Val Leu	
4210	4215 4220
ggc tcc gtc ctc gtg ccc ggc acc gcg ctg gtg gaa ctg gtg ctg cgg	12720
Gly Ser Val Leu Val Pro Gly Thr Ala Leu Val Glu Leu Val Leu Arg	
4225	4230 4235 4240
gcg gcc gac gag gcc ggc tgt gac ctc ctg gag gag ctg acg ctc gcc	12768
Ala Ala Asp Glu Ala Gly Cys Asp Leu Leu Glu Glu Leu Thr Leu Ala	
4245	4250 4255
gca ccg ctg gtg ctg ccc gcc tcg ggc gcc gcg gtc cag gtt cag gta	12816
Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Val Gln Val Gln Val	
4260	4265 4270
gcg gtg ggc gag ccc gat gag gcg ggc cgc cgg ccg gtc tcg gtc cat	12864
Ala Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser Val His	
4275	4280 4285
gca cgt gag ggc gag ggc cca tgg acg ctg cac gcc agt ggt gcg gtg	12912
Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Ser Gly Ala Val	
4290	4295 4300
acc tcg ggc gcc gaa gtg ccc ccc ttc gac gcc acc gta tgg ccg ccc	12960
Thr Ser Gly Ala Glu Val Pro Pro Phe Asp Ala Thr Val Trp Pro Pro	
4305	4310 4315 4320
aag ggc gcg gag ccc gtg gac gtg gcg gac tgc tac gac gta ctc gcc	13008
Lys Gly Ala Glu Pro Val Asp Val Ala Asp Cys Tyr Asp Val Leu Ala	

4325	4330	4335	
gat gcc ggg ctc acc tac ggc ccg gcc ttc cac ggc ctg caa gcg gcc			13056
Asp Ala Gly Leu Thr Tyr Gly Pro Ala Phe His Gly Leu Gln Ala Ala			
4340	4345	4350	
tgg aag ctc ggt ggg gac gtc tac gcc gag gcg aag ctc ccc gag agc			13104
Trp Lys Leu Gly Gly Asp Val Tyr Ala Glu Ala Lys Leu Pro Glu Ser			
4355	4360	4365	
acc gac ggc gac gca tac ggt ctg cac ccc gcg ctc ttc gac gcc gcg			13152
Thr Asp Gly Asp Ala Tyr Gly Leu His Pro Ala Leu Phe Asp Ala Ala			
4370	4375	4380	
ctg cac gcg tcg gcg ctg ggc ggc gcg gaa gcg ggc gga gtc ccg ttc			13200
Leu His Ala Ser Ala Leu Gly Gly Ala Glu Ala Gly Gly Val Pro Phe			
4385	4390	4395	4400
tcc tgg gcc gga gtg tcg ctg cac gcg acc ggc gcc tcg cac ctc cgc			13248
Ser Trp Ala Gly Val Ser Leu His Ala Thr Gly Ala Ser His Leu Arg			
4405	4410	4415	
gtc cgc atc cgc gaa gcg ggc ggc gcg ctg tcg gtc gcg atc gcg gac			13296
Val Arg Ile Arg Glu Ala Gly Gly Ala Leu Ser Val Ala Ile Ala Asp			
4420	4425	4430	
acg tcc ggc gcg ccg gtc gcc tcg gtg gag tcg ctg gtg ata cgt ccg			13344
Thr Ser Gly Ala Pro Val Ala Ser Val Glu Ser Leu Val Ile Arg Pro			
4435	4440	4445	
ctc tcg gcc ggg cag gtg cag gcc gcc gac cgt gac gcc ctc ttc aag			13392
Leu Ser Ala Gly Gln Val Gln Ala Ala Asp Arg Asp Ala Leu Phe Lys			
4450	4455	4460	
gcc gac tgg gtc ccc gta ccg ctc acg gac gaa cgc gtc gag ccg ggc			13440
Ala Asp Trp Val Pro Val Pro Leu Thr Asp Glu Arg Val Glu Pro Gly			
4465	4470	4475	4480
acc ggc ccg gag ggc gag ccg ctg cgg acg tac gcg gat ctg gat tcc			13488
Thr Gly Pro Glu Gly Glu Pro Leu Arg Thr Tyr Ala Asp Leu Asp Ser			
4485	4490	4495	
ctg gag ggc gcg gcc gtg ccc ggg acg gtc ctg gtc gcg ccg cct tcc			13536
Leu Glu Gly Ala Ala Val Pro Gly Thr Val Leu Val Ala Pro Pro Ser			
4500	4505	4510	
ggc gct gcc ggg acg gtg gag tcc gta cac gcc gcg acc gtc tgg gcg			13584
Gly Ala Ala Gly Thr Val Glu Ser Val His Ala Ala Thr Val Trp Ala			
4515	4520	4525	
ctg gag atg gtg cag gcg tgg ctg gcc gac gac cgg ttc gcc acc tcg			13632
Leu Glu Met Val Gln Ala Trp Leu Ala Asp Asp Arg Phe Ala Thr Ser			
4530	4535	4540	
cga ctg gtg ttc gtc acc cgc ggc gcg gcc ttc ggc gcg gat ctt gcg			13680
Arg Leu Val Phe Val Thr Arg Gly Ala Ala Phe Gly Ala Asp Leu Ala			
4545	4550	4555	4560

gcg gcc gcc gtc cgg ggc ctg gtg cgc tcg gca cag tcg gag aac ccg	13728
Ala Ala Ala Val Arg Gly Leu Val Arg Ser Ala Gln Ser Glu Asn Pro	
4565 4570 4575	
ggc cgc ttc ggc ctg gtg gac atg gac ggc gac gcc gat acg acc gta	13776
Gly Arg Phe Gly Leu Val Asp Met Asp Gly Asp Ala Asp Thr Thr Val	
4580 4585 4590	
ccg gcg caa gcg ctc gcg acc gac gag ccc gaa ctg ctg gtg cgt ggt	13824
Pro Ala Gln Ala Leu Ala Thr Asp Glu Pro Glu Leu Leu Val Arg Gly	
4595 4600 4605	
ggt gag gtg ctg gcg gcc cgg ctg gtc cgg gcg cag tcc tcg cac acg	13872
Gly Glu Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser His Thr	
4610 4615 4620	
gtg acg tgg gat ccg tcc ggt acg gtc ctg atc acc ggc ggg acc ggt	13920
Val Thr Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly	
4625 4630 4635 4640	
ggg ctg ggc cgt agt gtc gcc cgg cac ttg gtg agc gag cac ggg gtg	13968
Gly Leu Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val	
4645 4650 4655	
cgc agt ctg ctg ctg gtc agc cgc cgt ggt ccc gcg gcc gag ggt gcc	14016
Arg Ser Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Ala	
4660 4665 4670	
ggg gag ttg gtg gcc gaa ctc agg ggc agt ggc gcc gag gtg gtc atc	14064
Gly Glu Leu Val Ala Glu Leu Arg Gly Ser Gly Ala Glu Val Val Ile	
4675 4680 4685	
gag gct tgt gat gtg acc gat gcg gtg gcg gtg gcc gat ctg gtg gct	14112
Glu Ala Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala	
4690 4695 4700	
cgg cat cgg atc agt gct gtg gtg cat acg gcc ggt gtt ctg gat gac	14160
Arg His Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp	
4705 4710 4715 4720	
ggt gtg gtg gag tcg ctg acg ccg gag cgg ctt gcg gtg gtg ttg cgt	14208
Gly Val Val Glu Ser Leu Thr Pro Glu Arg Leu Ala Val Val Leu Arg	
4725 4730 4735	
ccg aag gtg gat gcg gcc tgg aac ctg cac gag gcg acc agg ggt ctg	14256
Pro Lys Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu	
4740 4745 4750	
gat ctg gat gcg ttt gtg gtg ttc tcg tcc gtg gca ggc act ttc ggc	14304
Asp Leu Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly	
4755 4760 4765	
agt gcg ggt cag gcc aat tac gcg gcg ggt aat gct ttc ctg gac gcg	14352
Ser Ala Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala	
4770 4775 4780	

ctg gcg tat cac cgt cgg gcg gtg ggt ctg ccg gcg gtg tcg ctg gcg	14400
Leu Ala Tyr His Arg Arg Ala Val Gly Leu Pro Ala Val Ser Leu Ala	
4785 4790 4795 4800	
tgg ggc cct tgg tcg cag gac ggt ggt atg acc ggc acc ttg agc gac	14448
Trp Gly Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp	
4805 4810 4815	
gcc gat gtc cag cgc atc gcc cgg cag ggc atg ccg ccg ctg acc gtc	14496
Ala Asp Val Gln Arg Ile Ala Arg Gln Gly Met Pro Pro Leu Thr Val	
4820 4825 4830	
gag gag ggt ctg gcc ctc ttc gac gcc gcg ctc ggc agc gcc gaa ccc	14544
Glu Glu Gly Leu Ala Leu Phe Asp Ala Ala Leu Gly Ser Ala Glu Pro	
4835 4840 4845	
atg gca ctc ccg gtc cgc ctg gac ctg gcg gcg ctg ccg gca caa ggc	14592
Met Ala Leu Pro Val Arg Leu Asp Leu Ala Ala Leu Arg Ala Gln Gly	
4850 4855 4860	
gag ccc cag cca ctg ctg cgc ggc ctc atc ccg acg agg acc cgc ccg	14640
Glu Pro Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Arg Thr Arg Arg	
4865 4870 4875 4880	
tcc ggc gcc gcc gcg gca tcc ggc atc gcg cag cgc ctt gcc ggg ctg	14688
Ser Gly Ala Ala Ala Ala Ser Gly Ile Ala Gln Arg Leu Ala Gly Leu	
4885 4890 4895	
tcc acg gcg gag cgg cgc gag gcg ctg ctc gat gtc gta ccg gcc cag	14736
Ser Thr Ala Glu Arg Arg Glu Ala Leu Leu Asp Val Val Arg Ala Gln	
4900 4905 4910	
atc gcg acg gtc ctg ggc cac gcc ggc ccg gaa acg atc gcc cct gac	14784
Ile Ala Thr Val Leu Gly His Ala Gly Pro Glu Thr Ile Ala Pro Asp	
4915 4920 4925	
cgg gcc ttc cag gac ctc ggc ctc gac tcc ctg acg gcg atc gaa ctc	14832
Arg Ala Phe Gln Asp Leu Gly Leu Asp Ser Leu Thr Ala Ile Glu Leu	
4930 4935 4940	
cgt aac ctg ctc ggc aag gcc acc ggg ctg ccg ctc ccg gca acg acc	14880
Arg Asn Leu Leu Gly Lys Ala Thr Gly Leu Arg Leu Pro Ala Thr Thr	
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Val Pro Gly Leu Pro Ser Leu Ala Asp Asp Pro Val Val Ile Val Gly	
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Arg	Gly	Trp	Glu	Ile	Asp	Asp	Thr	Tyr	Asp	Pro	Glu	Arg	Glu	Gly	Ala	
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Ile	Ala	Thr	Arg	Ser	Gly	Gly	Phe	Leu	His	Asp	Ala	Ala	Glu	Phe	Asp	
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Pro	Glu	Phe	Phe	Gly	Met	Ser	Pro	Arg	Glu	Ala	Leu	Thr	Thr	Asp	Ala	
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Gln	Gln	Arg	Leu	Leu	Leu	Glu	Thr	Thr	Trp	Glu	Ala	Leu	Glu	Arg	Ala	
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Gly	Met	Asp	Pro	Ala	Thr	Leu	Arg	Gly	Ser	Arg	Thr	Gly	Val	Phe	Ala	
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Gly	Val	Met	Tyr	His	Asp	Tyr	Ser	Thr	Leu	Leu	Ser	Gly	Arg	Glu	Phe	
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Glu	Gly	Tyr	Gln	Gly	Ser	Gly	Ser	Ala	Gly	Ser	Val	Ala	Ser	Gly	Arg	
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Val	Ser	Tyr	Thr	Phe	Gly	Phe	Glu	Gly	Pro	Ala	Val	Thr	Val	Asp	Thr	
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Ala	Cys	Ser	Ser	Ser	Leu	Val	Ala	Leu	His	Leu	Ala	Ala	Gln	Ser	Leu	
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Arg	Ser	Gly	Glu	Cys	Ser	Leu	Ala	Leu	Ala	Gly	Gly	Val	Thr	Val	Met	
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tgg	gcc	gaa	ggc	gcc	gga	atc	ctg	gtg	ctg	gag	cgt	ctg	tcg	gac	gcc	15744
Trp	Ala	Glu	Gly	Ala	Gly	Ile	Leu	Val	Leu	Glu	Arg	Leu	Ser	Asp	Ala	

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gat ccg atc gag gcc cag gcg ctg ctc gcg acg tat ggc cag gag ccg Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg 5315 5320 5325			15984
ccg gag gac cgg ccg ttg ctg ctc ggc tcc gtg aag tcc aac atc ggt Pro Glu Asp Arg Pro Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly 5330 5335 5340			16032
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Ala Tyr Ser Leu Ala Thr Gly Arg Ser Ala Phe Pro His Arg Ala Val	
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Ile Leu Ala Ala Asn Arg Ala Asp Leu Leu His Ser Leu Ser Ala Leu	
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Gly Tyr Ala Gln Thr Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg	
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Leu Leu Glu Ser Trp Gly Val Arg Pro Asp His Leu Leu Gly His Ser	
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Ile Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Leu Ser Leu Pro	
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Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu	
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Pro Ser Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val	
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Leu Pro His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro	
5685 5690 5695	

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Ser Ser Val Val Val Ser Gly Ala Glu Asp Glu Val Leu Ala Leu Ala	
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Ala His Phe Glu Glu Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser	
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His Ala Phe His Ser Pro Leu Met Glu Pro Met Leu Ala Asp Phe Arg	
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Thr Gly Arg Leu Ser Leu Ser Ser His Pro Trp Leu Ala Asp His Val	
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Gln Val Trp Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser	
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Val His Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Asp Gly	
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Ala Leu Ala Pro Ala Ala Glu Thr Val Pro Phe Asp Thr Ala Ile Trp	
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Pro Pro Gln Gly Ala Glu His Leu Asp Ala Ala Gly Cys Tyr Glu Arg	
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Phe Ala Asp Ala Gly Phe Ala Tyr Gly Pro Val Phe Gln Gly Leu Arg	
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Glu Gly Thr Asp Gly Asn Ala Tyr Gly Leu His Pro Ala Leu Phe Asp	
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Ser Arg Val Arg Val Arg Ile Arg Pro Thr Glu Gly Gly Thr Ser Ile	
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Thr Ala Arg Pro Ile Thr Ala Gly Gln Leu Gln Thr Gly Asp Arg Asp				
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Ser Leu Phe Gln Val Asp Trp Thr Thr Leu His Leu Thr Asp Glu Arg				
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Gly Val His Asp Thr Val Leu Ala Pro Leu Pro Thr Arg Thr Ala Gly				
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Thr Val Glu Ser Val His Ala Ala Thr Thr Gly Ala Leu Ala Leu Ile				
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Arg Ser Trp Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe				
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Val Thr Arg Gly Ala Val Ser Gly Thr Asp Leu Ala Gly Ala Ser Val				
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Trp Gly Leu Val Arg Ser Ala Leu Leu Glu His Pro Gly Arg Phe Gly				
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Leu Val Asp Val Asp Val Asp Gln Asp Ala Glu Val Pro Leu Val Pro				
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Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser Asp Thr Val Thr				
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Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly Gly Leu				
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Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala Arg His	
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Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp Gly Val	
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<213> Streptomyces natalensis

<400> 4

Met Ser Asn Glu Glu Lys Leu Arg Glu Tyr Leu Lys Arg Ala Ile Ala
1 5 10 15

Asp Leu His Glu Thr Arg Gln Gln Leu Asp Glu Thr Glu Ala Lys Gln
 20 25 30
 Arg Glu Pro Leu Ala Ile Val Ser Met Ala Cys Arg Phe Pro Gly Gly
 35 40 45
 Val Arg Ser Pro Glu Glu Leu Trp Glu Leu Leu Arg Asp Gly Val Asp
 50 55 60
 Ala Val Ser Ser Phe Pro Arg Asn Arg Gly Trp Asp Leu Asp Ala Leu
 65 70 75 80
 Tyr His Ser Asp Pro Ala His Gln Gly Thr Ser Tyr Ala Arg Glu Gly
 85 90 95
 Gly Phe Leu His Asp Ala Gly Glu Phe Asp Pro Gly Phe Phe Gly Ile
 100 105 110
 Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
 115 120 125
 Glu Thr Ala Trp Glu Ala Val Glu Arg Ala Gly Ile Asp Pro Glu Ser
 130 135 140
 Leu Ala Gly Ser Arg Thr Gly Val Phe Val Gly Thr Gly His Gly Gly
 145 150 155 160
 Tyr Asp Ala Glu Gly Arg Arg Arg Ala Asp Glu Val Gly Gly His Leu
 165 170 175
 Leu Thr Gly Asn His Ile Ser Ile Ala Ser Gly Arg Ile Ser Tyr Val
 180 185 190
 Leu Gly Leu Glu Gly Pro Ala Leu Thr Val Asp Thr Ala Cys Ser Ser
 195 200 205
 Ser Leu Val Ala Leu His Leu Ala Met His Ala Leu Arg Arg Asp Glu
 210 215 220
 Cys Ala Met Ala Leu Val Gly Gly Ala Thr Val Met Ser Thr Pro Gln
 225 230 235 240
 Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg
 245 250 255
 Cys Lys Pro Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly
 260 265 270
 Val Gly Leu Leu Leu Val Glu Arg Leu Ser Asp Ala Val Arg Asn Gly
 275 280 285
 Tyr Pro Val Leu Ala Val Leu Lys Gly Ser Ala Val Asn Gln Asp Gly
 290 295 300
 Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val
 305 310 315 320

Ile Arg Gln Ala Leu Thr Gly Ala Gly Leu Ala Ala Ser Asp Ile Asp
 325 330 335
 Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Val Glu
 340 345 350
 Ala His Ala Leu Leu Ala Thr Tyr Gly Gln Gln Arg Ala Ala Asp Arg
 355 360 365
 Pro Cys Gly Leu Gly Ser Met Lys Ser Asn Ile Gly His Thr Gln Ala
 370 375 380
 Ala Ala Gly Ile Ala Gly Val Met Lys Met Val Leu Ala Met Arg His
 385 390 395 400
 Gly His Leu Pro Arg Thr Leu His Leu Asp Glu Pro Thr Gly His Val
 405 410 415
 Asp Trp Ser Glu Gly Asn Ala Arg Leu Leu Ala Glu Pro Glu Pro Trp
 420 425 430
 Pro Ser Ala Gly Arg Pro Arg Arg Ala Ala Val Ser Ser Phe Gly Ile
 435 440 445
 Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ala Pro Ala His Glu
 450 455 460
 Ala Glu Pro Ala Pro Glu Pro Ala Ala Arg Pro Gly Ala Leu Pro Trp
 465 470 475 480
 Ile Leu Ser Ala Arg Thr Glu Ala Gly Leu Arg Ala Gln Ala Asp Arg
 485 490 495
 Leu Gly Arg His Leu Arg Asp Arg Ala Asp Leu Glu Pro Ala Ala Val
 500 505 510
 Ala His Ala Leu Ala Asp Thr Arg Thr Leu Met Glu His Arg Ala Val
 515 520 525
 Val Val Ala Gly Asp Arg Glu Glu Phe Leu Arg Gly Leu Asp Ala Leu
 530 535 540
 Ala Ala Gly Arg Thr Ala Asn Gly Leu Val Ser Gly Val Ala Val Lys
 545 550 555 560
 Ala Ala Ser Ala Phe Leu Phe Ala Gly Gln Gly Ser Gln Arg Pro Gly
 565 570 575
 Met Gly Arg Glu Leu His Ala Ala His Pro Val Phe Ala Thr Ala Phe
 580 585 590
 Asp Ala Val Cys Ala Glu Leu Asp Pro His Leu Asp Arg Pro Leu Arg
 595 600 605
 Asp Ile Val Phe Ala Glu Glu Gly Ser Ala Glu Ala Ala Leu Leu Asp
 610 615 620

Gln Thr Ala Tyr Thr Gln Ala Ala Leu Phe Ala Leu Glu Thr Ala Leu	625	630	635	640
Phe Arg Leu Val Glu Ser Trp Gly Val Ala Pro Arg Phe Val Ala Gly	645	650	655	
His Ser Ile Gly Glu Leu Thr Ala Ala His Val Ser Gly Val Leu Thr	660	665	670	
Leu His Asp Ala Ala Arg Leu Val Ala Ala Arg Gly Thr Leu Met Gln	675	680	685	
Ala Leu Pro Ala Gly Gly Ala Met Val Ala Val Gln Ala Thr Glu Asp	690	695	700	
Glu Ile Arg Glu Arg Leu Ala Gly His Glu Asp His Val Ala Leu Ala	705	710	715	720
Ala Ala Asn Gly Pro Asp Ser Thr Val Ile Ser Gly Asp Glu Gln Ala	725	730	735	
Val Thr Glu Ile Ala Ala His Trp Glu Ala Gln Gly Arg Arg Thr Lys	740	745	750	
Arg Leu Arg Val Ser His Ala Phe His Ser Pro His Met Asp Asp Met	755	760	765	
Leu Glu Asp Phe Arg Arg Val Ala Arg Gly Leu Thr Phe His Ala Pro	770	775	780	
Arg Ile Pro Val Val Ser Thr Val Thr Gly Ala Leu Ala Thr Glu Asp	785	790	795	800
Glu Leu Arg Ser Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Thr Val	805	810	815	
Arg Phe Cys Ala Ala Val Arg Thr Leu Glu Ala Glu Gly Val Thr Thr	820	825	830	
Phe Val Glu Ile Gly Thr Gly Gly Val Leu Thr Pro Met Val Gln Asp	835	840	845	
Cys Leu Thr Thr Leu Glu Glu Pro Val Leu Val Pro Leu Leu Arg Thr	850	855	860	
Gly Arg Pro Glu Thr Val Ala Leu Thr Glu Gly Val Ala Thr Ala Phe	865	870	875	880
Val His Gly Val Pro Val Asp Arg Ser Ala Phe Pro Gly Ala Pro Gly	885	890	895	
Thr Ser Arg Ala Asp Leu Pro Thr Tyr Ala Phe Gln Arg Gln Trp Tyr	900	905	910	
Trp Leu Asp Pro Ala Asp His Asp Glu Gly Glu Ala Ala Ala Ala Glu	915	920	925	

Ala Gly Glu Ala Gly Phe Trp Ala Ala Val Glu Arg Glu Asp Leu Gln
 930 935 940
 Glu Leu Ser Ala Val Leu Ala Ile Asp Gly Ser Glu Ala Asp Ser Leu
 945 950 955 960
 Gly Ser Phe Leu Pro Thr Leu Ser Ser Trp Arg Arg Gln Arg Arg Thr
 965 970 975
 Gln Ala Ala Ala Asp Arg Phe Ser Tyr Arg Thr His Trp Ala Pro Arg
 980 985 990
 Thr Ala Ser Gly Gly Pro Thr Ala Thr Gly His Trp Leu Val Val Leu
 995 1000 1005
 Pro Glu Gly Gly Thr Asp Asp Pro Trp Thr Ala Arg Leu Leu Asp Ala
 1010 1015 1020
 Leu Asn Asp Gln Gly Leu His Thr Asp Val Arg Glu Leu Pro Ala Asp
 1025 1030 1035 1040
 His Glu Pro Asp Ala Trp Gly Arg His Pro Val Asp Gly Val Leu Cys
 1045 1050 1055
 Leu Leu Ala Leu Asp Glu Arg Pro Thr Arg Ser Cys Pro Pro Tyr Arg
 1060 1065 1070
 Arg Gly Leu Ala Ala Thr Thr Asn Ala Ala Ala Arg Pro Glu Gly Ala
 1075 1080 1085
 Gly Ile Gln Ala Pro Leu Trp Cys Val Thr Arg Gly Ala Val Ala Val
 1090 1095 1100
 Asp Arg His Glu Ala Leu Lys Ser Pro Leu Gln Ala Gln Thr Trp Gly
 1105 1110 1115 1120
 Leu Gly Arg Val Ala Ala Leu Glu Ser Pro Gln Ser Trp Gly Gly Leu
 1125 1130 1135
 Ile Asp Leu Pro Asp Asn Leu Asp Gly Arg Ala Val Ser Ala Leu Leu
 1140 1145 1150
 Ser Thr Leu Ala Gly Glu Glu Asp Gln Val Ala Val Arg Pro Ala Gly
 1155 1160 1165
 Val Phe Ala Arg Arg Leu Glu Arg Ile Thr Pro Gly Gly Asp Thr Gly
 1170 1175 1180
 Asp Arg Trp Ser Thr His Gly Thr Val Leu Val Thr Gly Gly Thr Gly
 1185 1190 1195 1200
 Ala Leu Gly Ala His Leu Ala His Trp Leu Ala Asp Ala Gly Ala Glu
 1205 1210 1215
 His Leu Val Leu Thr Gly Arg Arg Gly Pro Gln Ala Pro Gly Ala Pro
 1220 1225 1230

Glu Leu Ala Ala Ala Leu Thr Asp Arg Gly Val Lys Val Thr Leu Ala
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 Ala Cys Asp Ala Ala Asp Arg Asp Ala Leu Ala Ala Val Leu Ala Asp
 1250 1255 1260
 Ile Pro Pro His Leu Pro Leu Thr Gly Val Val His Ala Ala Gly Val
 1265 1270 1275 1280
 Leu Asp Asp Gly Val Leu Asp Ala Leu Thr Pro Glu Arg Phe Glu Thr
 1285 1290 1295
 Val Leu Arg Pro Lys Ala Arg Ala Ala Gln Asn Leu His Glu Leu Thr
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 Gln Asp Leu Asp Leu Asp His Phe Val Leu Phe Ser Ser Ile Val Gly
 1315 1320 1325
 Val Leu Gly Asn Ala Gly Gln Ala Asn Tyr Ala Ala Ala Asn Ala Tyr
 1330 1335 1340
 Leu Asp Ala Leu Ala Glu His Arg Leu Ala Gln Gly Leu Pro Ala Thr
 1345 1350 1355 1360
 Ser Val Ser Trp Gly Pro Gly Gln Ala Ala Ala Trp His Asp Ser Asp
 1365 1370 1375
 Ala Ala Asp Arg Met Ser Arg Asp Gly Leu Leu Pro Met Ala Ala Ala
 1380 1385 1390
 Pro Arg Arg Arg Pro Ala Pro Ala Leu Ala Gln Gly Met Thr Gln Val
 1395 1400 1405
 Thr Val Ala Asp Ile Asp Trp Ser Ala Tyr Ala Pro Ala Leu Thr Ala
 1410 1415 1420
 Val Arg Pro Ser Pro Leu Ile Gly Asp Leu Pro Glu Ala Arg Arg Ala
 1425 1430 1435 1440
 Leu Gly Pro Ala Glu Gly Pro Arg Arg Glu Arg Ser Pro Leu Arg Asp
 1445 1450 1455
 Arg Ile Gly Ala Leu Pro Pro Ala Glu Gln Glu Lys Ala Phe Leu Thr
 1460 1465 1470
 Met Val Arg Glu Glu Ala Ala Arg Val Leu Gly His Pro Ser Pro Asp
 1475 1480 1485
 Thr Val Asp Ala Gln Arg Ala Phe Arg Glu Gln Gly Phe Asp Ser Leu
 1490 1495 1500
 Met Ala Val Asp Leu Arg Asn Arg Leu Ser Ala Ala Thr Gly Leu Arg
 1505 1510 1515 1520
 Leu Pro Ala Thr Leu Leu Phe Asp His Pro Thr Pro Leu Ala Ala Ala
 1525 1530 1535

Ala Cys Leu Arg Ser Glu Val Leu Gly Ala Ala Gly Pro Ala Thr Val
 1540 1545 1550
 Val Gln Ala Ser Thr Ala Ala Leu Asp Glu Pro Val Ala Ile Ile Gly
 1555 1560 1565
 Met Ala Cys Arg Phe Pro Gly Gly Val His Ser Pro Glu Ala Leu Trp
 1570 1575 1580
 Arg Leu Leu Ala Glu Gly Gly Asp Ala Ile Thr Pro Met Pro Ala Asp
 1585 1590 1595 1600
 Arg Gly Trp Asp Leu Asp Arg Leu Tyr His Pro Asp Pro Asp His Gln
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 Gly Thr Ser Tyr Ala Arg Gly Gly Gly Phe Leu Asp Gly Ala Ala Asp
 1620 1625 1630
 Phe Asp Ala Asp Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met
 1635 1640 1645
 Asp Pro Gln Gln Arg Leu Leu Leu Glu Thr Trp Glu Val Leu Glu Gln
 1650 1655 1660
 Ala Gly Ile Asp Pro Glu Ser Leu Arg Gly Ser Ser Thr Gly Val Phe
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 Ala Gly Thr Asn Thr Gln Asp Tyr Gly Thr Ala Leu Asp Ala Ala Gln
 1685 1690 1695
 Asp Glu Ala Gly Gly His Arg Leu Thr Gly Asn Ala Met Ser Val Val
 1700 1705 1710
 Ser Gly Arg Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Leu Thr
 1715 1720 1725
 Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Met Ala Ala
 1730 1735 1740
 Gln Ala Leu Arg Gln Gly Glu Cys Ser Leu Ala Val Ala Gly Gly Val
 1745 1750 1755 1760
 Thr Val Met Ala Thr Pro Ser Ser Phe Val Glu Phe Ala Arg Gln Arg
 1765 1770 1775
 Gly Leu Ala Pro Asp Gly Arg Cys Lys Pro Phe Ala Ala Ala Ala Asp
 1780 1785 1790
 Gly Thr Gly Trp Ser Glu Gly Val Gly Leu Leu Leu Val Glu Arg Leu
 1795 1800 1805
 Ser Asp Ala Arg Arg Asn Gly His Gln Val Leu Ala Val Val Arg Gly
 1810 1815 1820
 Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ser Ala Pro Ser
 1825 1830 1835 1840

Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn Ala Arg
 1845 1850 1855
 Val Ala Ala Ser Glu Val Asp Ala Val Glu Ala His Gly Thr Gly Thr
 1860 1865 1870
 Thr Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Leu Ala Thr Tyr Gly
 1875 1880 1885
 Gln Glu Arg Pro Leu Leu Leu Gly Ala Val Lys Ser Asn Leu Gly His
 1890 1895 1900
 Thr Gln Ala Ala Ala Gly Val Ala Gly Val Met Lys Met Val Leu Ala
 1905 1910 1915 1920
 Met Arg His Gly Met Leu Pro Arg Thr Leu His Val Asp Glu Pro Thr
 1925 1930 1935
 Gly His Val Asp Trp Thr Ala Gly Ala Val Glu Leu Leu Thr Glu His
 1940 1945 1950
 Thr Asp Trp Pro Glu Thr Gly His Pro Arg Arg Ala Ala Val Ser Ala
 1955 1960 1965
 Phe Gly Ile Ser Gly Thr Asn Ala His Val Val Leu Glu Leu Pro Ala
 1970 1975 1980
 Ala Glu Gln Pro Leu Val Glu Gln Pro Ser Ala Ala Glu Pro Asp Ala
 1985 1990 1995 2000
 Pro Ala Thr Ala Pro Asp Arg Thr Pro Thr Ala Ser Asp Gly Thr Ala
 2005 2010 2015
 Pro Leu Leu Leu Ser Ala Lys Ser Glu Ser Ala Leu Arg Ala Gln Ala
 2020 2025 2030
 Ala Arg Leu His Ser His Leu Glu Arg Asp Pro Ala Leu Arg Leu Thr
 2035 2040 2045
 Asp Ala Ala Tyr Thr Leu Met Thr His Arg Thr Ala Phe Ala His Arg
 2050 2055 2060
 Ala Ala Val Arg Ala Ala Asp His Glu Ala Ala Leu Arg Ala Leu Thr
 2065 2070 2075 2080
 Ala Leu Ala Ala Gly Glu Ala Asp Pro Ala Val Asp Thr Gly Thr Ala
 2085 2090 2095
 His Thr Gly Arg Asp Ala Val Leu Phe Ser Gly Gln Gly Ser Gln Arg
 2100 2105 2110
 Ile Gly Met Gly Arg Glu Leu Ser Gly Arg Tyr Pro Val Phe Ala Glu
 2115 2120 2125
 Ala Phe Asp Thr Val Cys Ala Ala Leu Asp Glu His Leu Asp Arg Pro
 2130 2135 2140

Leu Arg Asp Val Val Arg Gly Glu Asp Glu Glu Leu Leu Asn Arg Thr
 2145 2150 2155 2160
 Val Tyr Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
 2165 2170 2175
 Leu Val Glu Ser Trp Gly Val Arg Pro His Tyr Val Ala Gly His Ser
 2180 2185 2190
 Val Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Phe Ser Leu Ala
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 Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Ala Leu
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 Pro Ala Gly Gly Ala Met Ala Ala Ile Arg Ala Thr Glu Asp Glu Val
 2225 2230 2235 2240
 Leu Pro His Leu Ala Asp Ser Val Ser Ile Ala Ala Val Asn Gly Pro
 2245 2250 2255
 Ser Ser Val Val Val Ser Gly Ala Glu His Ala Val Leu Ser Ile Ala
 2260 2265 2270
 Ala His Phe Glu Gly Ala Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
 2275 2280 2285
 His Ala Phe His Ser Pro Leu Met Asp Pro Met Leu Ala Asp Phe Arg
 2290 2295 2300
 Ala Val Ala Glu Gly Leu Thr Tyr Gly Glu Pro Glu Leu Ala Val Val
 2305 2310 2315 2320
 Ser Asn Val Thr Gly Gln Leu Ala Thr Pro Asp Gln Leu Arg Thr Pro
 2325 2330 2335
 Glu Tyr Trp Val Thr His Val Arg Ala Ala Val Arg Phe Ala Asp Gly
 2340 2345 2350
 Ile Arg Ala Leu Gly Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly
 2355 2360 2365
 Pro Asp Gly Val Leu Ser Ala Leu Ala Arg Glu Ser Ala Pro Asp Asp
 2370 2375 2380
 Ala Val Cys Thr Pro Val Leu Arg Lys Asp Arg Ser Glu Ala Ala Thr
 2385 2390 2395 2400
 Leu Leu Ala Ala Leu Thr His Leu His Val His Gly Thr Glu Ile Asp
 2405 2410 2415
 Trp Thr Ala Phe Leu Ala Gly Arg Asp Ala His Ala Val Asp Leu Pro
 2420 2425 2430
 Thr Tyr Ala Phe Gln His Gln Arg Phe Trp Pro Thr Pro Asp His Thr
 2435 2440 2445

Arg Thr Gly Asp Leu Gly Ala Val Gly Leu Glu Ala Thr Gly His Pro
 2450 2455 2460

Leu Leu Ser Ala Ala Val Glu Leu Pro Asp Gly Glu Gly Leu Leu Phe
 2465 2470 2475 2480

Thr Thr Arg Leu Ser Leu Gln Thr His Pro Trp Leu Ala Gly His Val
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Val Met Gly Ser Val Leu Leu Pro Gly Thr Ala Phe Ala Glu Leu Ala
 2500 2505 2510

Leu Arg Ala Ala Asp Glu Val Gly Cys Asp Arg Val Asp Glu Leu Thr
 2515 2520 2525

Leu Ala Ala Pro Leu Val Leu Pro Glu His Gly Gly Val Gln Leu Gln
 2530 2535 2540

Leu Arg Val Gly Pro Ala Asp Ala Ser Gly Arg Arg Thr Leu Thr Ala
 2545 2550 2555 2560

Arg Ser Arg Ala Glu Gly Asp Gly Asp Arg Pro Trp Val Gln His Ala
 2565 2570 2575

Thr Gly Val Leu Ala Glu Gly Glu Ser Thr Pro Glu Pro Gly Tyr Asp
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Phe His Thr Glu Ser Trp Pro Pro Ala Asp Ala Ala Pro Val Glu Leu
 2595 2600 2605

Ser Gly Leu Tyr Pro Asp Phe Ala Ala His Gly Phe Asp Tyr Gly Pro
 2610 2615 2620

His Phe Gln Gly Leu Arg Thr Ala Trp Arg Arg Gly Asp Glu Val Phe
 2625 2630 2635 2640

Ala Glu Val Ala Leu Pro Ala Glu Ala Glu Gly Glu Ala Ser Ala Tyr
 2645 2650 2655

Gly Leu His Pro Ala Leu Leu Asp Ala Ala Leu His Val Val Ala Phe
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Asn Gly Val Asp Arg Gly Val Val Pro Phe Ser Trp Glu Ser Val Ala
 2675 2680 2685

Leu His Ala Thr Gly Ala Ser Ala Val Arg Ile Arg Val Val Arg His
 2690 2695 2700

Ser Gly Asp Thr Val Ser Val Asp Val Ala Asp Thr Thr Gly Glu Pro
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Val Ala Ser Ile Gly Thr Leu Val Leu Arg Ala Val Ser Ala Asp Gln
 2725 2730 2735

Leu Ala Gly Gly Ala Asp Pro Ala Val Arg Asp Ala Leu Phe Arg Val
 2740 2745 2750

Gln Trp Asn Pro Val Arg Leu Pro Pro Ala Gly Ala Ala Val Thr Val
 2755 2760 2765
 Ala Thr Leu Gly Ser Leu Ala Gly Ala Pro Phe Asp Gly Tyr Pro Asp
 2770 2775 2780
 Leu Ala Ser Leu Ala Arg Ser Gly Arg Val Ala Gly Ala Val Leu Val
 2785 2790 2795 2800
 Pro Val Glu Ala Gly Ala Gly Glu Val Val Ala Asp Asp Val Val Gly
 2805 2810 2815
 Ala Thr His Ala Thr Ala Ala Arg Ala Leu Asp Leu Ala Arg Ser Trp
 2820 2825 2830
 Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe Val Thr Arg
 2835 2840 2845
 Gly Ala Val Ser Gly Ala Asp Leu Ala Gly Ala Ala Val Trp Gly Leu
 2850 2855 2860
 Val Arg Ser Ala Leu Ser Glu His Pro Gly Arg Phe Gly Leu Val Asp
 2865 2870 2875 2880
 Leu Asp Asp Asp Ala Glu Leu Ala Leu Val Pro Arg Val Leu Ala Ser
 2885 2890 2895
 Asp Glu Pro Gln Leu Leu Val Arg Gly Gly Glu Val Leu Ala Ala Arg
 2900 2905 2910
 Leu Ala Arg Ala Gln Ser Ser His Ala Val Thr Trp Asp Pro Ser Gly
 2915 2920 2925
 Thr Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Arg Val Met Ala
 2930 2935 2940
 Arg His Leu Val Val Glu His Gly Val Arg Asn Leu Leu Leu Val Ser
 2945 2950 2955 2960
 Arg Arg Gly Pro Ala Ala Glu Gly Ala Glu Glu Leu Val Thr Glu Leu
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 Arg His Ser Gly Ala Glu Val Ala Val Glu Ala Cys Asp Val Thr Asp
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 2995 3000 3005
 Val His Thr Ala Gly Val Leu Asp Asp Gly Val Val Glu Ser Leu Thr
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 Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys Val Asp Ala Ala Trp
 3025 3030 3035 3040
 Asn Leu His Glu Ala Thr Arg Asp Leu Asp Leu Asp Ala Phe Val Val
 3045 3050 3055

Phe Ser Ser Val Ala Gly Thr Ile Gly Ser Pro Gly Gln Ala Asn Tyr
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Ala Gly Leu Pro Ala Ala Ser Leu Ala Trp Gly Pro Trp Ser Arg Asp
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Gly Gly Met Thr Gly Thr Leu Thr Asp Val Asp Ser Ser Ala Ser Pro
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Gly Arg His Ala Arg Thr His Pro Arg Thr Gly Arg Gly Leu Phe Asp
3125 3130 3135
Ala Ala Leu Ala Ala Gly Asp Ala His Leu Leu Pro Val Arg Phe Asp
3140 3145 3150
Trp Ala Ser Leu Arg Ala Gln Gly Glu Val Pro Pro Leu Leu Arg Gly
3155 3160 3165
Leu Ile Arg Thr Arg Ala Arg Arg Ser Ala Val Gly Gly Ser Ala Ala
3170 3175 3180
Ala Ala Gly Leu Val Gly Arg Leu Ser Gly Arg Gly Thr Val Glu Arg
3185 3190 3195 3200
Arg Glu Val Leu Leu Asp Leu Val Arg Ala Gln Ile Ala Val Val Leu
3205 3210 3215
Gly His Ala Asn Pro Glu Thr Ile Glu Ser Thr Arg Val Phe Gln Asp
3220 3225 3230
Leu Gly Phe Asp Ser Leu Thr Ala Val Glu Leu Arg Asn Arg Leu Asn
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Asn Ala Thr Gly Leu Arg Leu Ser Ala Thr Ala Val Phe Asp Tyr Pro
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Thr Ala Asp Ala Leu Val Asp Phe Leu Leu Asp Glu Leu Phe Gly Ala
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Gln Glu Glu Ala Glu Leu Pro Ala Pro Val Pro Ser Pro Ala Gly Ala
3285 3290 3295
Ala Asp Asp Pro Val Val Ile Val Gly Met Ser Cys Arg Tyr Pro Gly
3300 3305 3310
Gly Val Gly Ser Pro Glu Asp Leu Trp Arg Leu Val Ser Glu Gly Val
3315 3320 3325
Asp Ala Val Ser Asp Phe Pro Thr Asp Arg Gly Trp Asp Val Glu Ser
3330 3335 3340
Leu Tyr Ser Pro Asp Pro Glu Ala Leu Gly Thr Ser Tyr Thr Arg Ser
3345 3350 3355 3360

Gly Gly Phe Leu His Glu Ala Ala Glu Phe Asp Pro Asp Phe Phe Gly
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 Met Ser Pro Arg Glu Ala Leu Ala Thr Asp Ala Gln Gln Arg Leu Leu
 3380 3385 3390
 Leu Glu Thr Thr Trp Glu Ala Ile Glu Arg Thr Gly Ile Asp Pro Ala
 3395 3400 3405
 Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Val Met Tyr Thr
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 Asp Tyr Gly Asp Leu Leu Val Gly Asp Gln Phe Glu Gly Tyr Arg Ser
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 Asn Gly Ser Ala Ala Ser Ile Ala Ser Gly Arg Val Ser Tyr Thr Phe
 3445 3450 3455
 Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser
 3460 3465 3470
 Leu Val Ala Leu His Trp Ala Ala Gln Ser Leu Arg Ser Gly Glu Cys
 3475 3480 3485
 Ser Leu Ala Val Ala Gly Gly Val Thr Val Met Ser Thr Pro Thr Thr
 3490 3495 3500
 Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ser Ala Asp Gly Arg Cys
 3505 3510 3515 3520
 Lys Ala Phe Ala Asp Ala Ala Asp Gly Val Gly Trp Gly Glu Gly Val
 3525 3530 3535
 Gly Met Leu Val Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His
 3540 3545 3550
 Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala
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 Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala Gln Gln Arg Val Ile
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 Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala Ala Asp Val Asp Ala
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 Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Ile Glu Ala
 3605 3610 3615
 Gln Ala Leu Leu Ala Thr Tyr Gly Gln Glu Arg Pro Glu Asp Arg Pro
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 Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly His Ala Gln Ala Ala
 3635 3640 3645
 Ser Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His Gly
 3650 3655 3660

Val Leu Pro Arg Thr Leu His Val Asp Glu Pro Ser Ser His Val Asp
3665 3670 3675 3680
Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser Glu Ala Glu Trp Pro
3685 3690 3695
Gln Gly Glu Gly Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser
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Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Gly Pro Asp Ala Ala
3715 3720 3725
Asp Ala Ala Pro Asp Ala Thr Val Thr Asp Pro Gly Ala Leu Ala Trp
3730 3735 3740
Val Leu Ser Ala Arg Asn Glu Ala Ala Leu Arg Cys Gln Ala Ala Arg
3745 3750 3755 3760
Leu Leu Ser Leu Val Ala Gly Ser Asp Ala Leu Cys Ala Arg Asp Ile
3765 3770 3775
Gly His Ser Leu Val Thr Gly Arg Ser Ser Phe Ala His Arg Ala Val
3780 3785 3790
Val Trp Gly Gln Asp Arg Asp Ala Leu Val Arg Ala Leu Ser Ala Leu
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Ala Val Gly Glu Ala Asp Ala Gly Leu Ala Glu Gly Ala Ser Gly Ala
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Gly Arg Thr Ala Phe Leu Phe Ser Gly Gln Gly Ser Gln Arg Leu Gly
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Met Gly Trp Glu Leu Tyr Ala Arg Tyr Pro Val Phe Ala Asp Ala Phe
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Asp Ala Val Cys Ala Ala Leu Asp Glu His Leu Glu Arg Pro Leu Arg
3860 3865 3870
Asp Val Val Trp Gly Glu Asp Ala Glu Leu Leu Asn Gln Thr Ala Tyr
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Ala Gln Ala Gly Leu Phe Ala Ile Glu Val Ala Leu Tyr Arg Leu Ala
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Glu Val Ala Ala Ala His Val Ser Gly Val Phe Ser Leu Pro Asp Ala
3925 3930 3935
Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu Pro Ser
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Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val Leu Pro
3955 3960 3965

His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro Ser Ser
 3970 3975 3980

Val Val Ile Ser Gly Ala Glu Asp Ala Val Leu Ala Ile Ala Ala His
 3985 3990 3995 4000

Phe Ala Gly Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser His Ala
 4005 4010 4015

Phe His Ser Pro Leu Met Glu Pro Met Leu Glu Glu Phe Arg Ala Val
 4020 4025 4030

Val Thr Arg Leu Ser Phe Gly Thr Pro Thr Ile Pro Val Val Ser Asn
 4035 4040 4045

Leu Thr Gly Arg Leu Ala Glu Pro Glu Gln Leu Ala His Ala Asp Tyr
 4050 4055 4060

Trp Val Arg His Val Arg Glu Ala Val Arg Phe Ala Asp Gly Ile Gln
 4065 4070 4075 4080

Ala Leu Arg Ala Glu Gly Val Thr Arg Phe Leu Glu Leu Gly Pro Asp
 4085 4090 4095

Gly Val Leu Ser Ala Met Ala Arg Glu Ser Ala Ser Asp Asp Ala Val
 4100 4105 4110

Leu Ala Pro Val Leu Arg Arg Asp Arg Pro Glu Glu Thr Ala Leu Leu
 4115 4120 4125

Gly Ala Leu Ala Gln Leu Tyr Val Arg Gly Ala His Val Asp Trp Thr
 4130 4135 4140

Val Pro Phe Ala Gly Ser Gly Ala Arg Trp Ala Asp Leu Pro Thr Tyr
 4145 4150 4155 4160

Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Val Ala Arg Pro
 4165 4170 4175

Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro Leu Leu
 4180 4185 4190

Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Leu Leu Phe Thr Gly
 4195 4200 4205

Arg Leu Ser Val Ser Ser His Pro Trp Leu Ala Asp His Val Val Leu
 4210 4215 4220

Gly Ser Val Leu Val Pro Gly Thr Ala Leu Val Glu Leu Val Leu Arg
 4225 4230 4235 4240

Ala Ala Asp Glu Ala Gly Cys Asp Leu Leu Glu Glu Leu Thr Leu Ala
 4245 4250 4255

Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Val Gln Val Gln Val
 4260 4265 4270

Ala Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser Val His
 4275 4280 4285

Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Ser Gly Ala Val
 4290 4295 4300

Thr Ser Gly Ala Glu Val Pro Pro Phe Asp Ala Thr Val Trp Pro Pro
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Lys Gly Ala Glu Pro Val Asp Val Ala Asp Cys Tyr Asp Val Leu Ala
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Asp Ala Gly Leu Thr Tyr Gly Pro Ala Phe His Gly Leu Gln Ala Ala
 4340 4345 4350

Trp Lys Leu Gly Gly Asp Val Tyr Ala Glu Ala Lys Leu Pro Glu Ser
 4355 4360 4365

Thr Asp Gly Asp Ala Tyr Gly Leu His Pro Ala Leu Phe Asp Ala Ala
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Leu His Ala Ser Ala Leu Gly Gly Ala Glu Ala Gly Gly Val Pro Phe
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Ser Trp Ala Gly Val Ser Leu His Ala Thr Gly Ala Ser His Leu Arg
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Val Arg Ile Arg Glu Ala Gly Gly Ala Leu Ser Val Ala Ile Ala Asp
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Thr Ser Gly Ala Pro Val Ala Ser Val Glu Ser Leu Val Ile Arg Pro
 4435 4440 4445

Leu Ser Ala Gly Gln Val Gln Ala Ala Asp Arg Asp Ala Leu Phe Lys
 4450 4455 4460

Ala Asp Trp Val Pro Val Pro Leu Thr Asp Glu Arg Val Glu Pro Gly
 4465 4470 4475 4480

Thr Gly Pro Glu Gly Glu Pro Leu Arg Thr Tyr Ala Asp Leu Asp Ser
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Leu Glu Gly Ala Ala Val Pro Gly Thr Val Leu Val Ala Pro Pro Ser
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Gly Ala Ala Gly Thr Val Glu Ser Val His Ala Ala Thr Val Trp Ala
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Leu Glu Met Val Gln Ala Trp Leu Ala Asp Asp Arg Phe Ala Thr Ser
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Arg Leu Val Phe Val Thr Arg Gly Ala Ala Phe Gly Ala Asp Leu Ala
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Gly Arg Phe Gly Leu Val Asp Met Asp Gly Asp Ala Asp Thr Thr Val
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 Pro Ala Gln Ala Leu Ala Thr Asp Glu Pro Glu Leu Leu Val Arg Gly
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 Gly Glu Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser His Thr
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 Val Thr Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly
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 Gly Leu Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val
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 Arg Ser Leu Leu Leu Val Ser Arg Arg Gly Pro Ala Ala Glu Gly Ala
 4660 4665 4670
 Gly Glu Leu Val Ala Glu Leu Arg Gly Ser Gly Ala Glu Val Val Ile
 4675 4680 4685
 Glu Ala Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala
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 Arg His Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp
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 Pro Lys Val Asp Ala Ala Trp Asn Leu His Glu Ala Thr Arg Gly Leu
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 Asp Leu Asp Ala Phe Val Val Phe Ser Ser Val Ala Gly Thr Phe Gly
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 Ser Ala Gly Gln Ala Asn Tyr Ala Ala Gly Asn Ala Phe Leu Asp Ala
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Ser Gly Ala Ala Ala Ala Ser Gly Ile Ala Gln Arg Leu Ala Gly Leu
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 Ser Thr Ala Glu Arg Arg Glu Ala Leu Leu Asp Val Val Arg Ala Gln
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 Arg Asn Leu Leu Gly Lys Ala Thr Gly Leu Arg Leu Pro Ala Thr Thr
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 Val Phe Asp Tyr Pro Thr Val Asp Ala Leu Ala Ala His Leu Leu Asp
 4965 4970 4975
 Glu Leu Phe Gly Ala Glu Thr Gly Thr Ala Thr Glu Thr Pro Leu Pro
 4980 4985 4990
 Val Pro Gly Leu Pro Ser Leu Ala Asp Asp Pro Val Val Ile Val Gly
 4995 5000 5005
 Met Ser Cys Arg Phe Pro Gly Gly Val Ala Ser Pro Glu Asp Leu Trp
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 Arg Leu Val Ala Asp Gly Val Asp Ala Val Ser Ala Phe Pro Thr Asp
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 Arg Gly Trp Glu Ile Asp Asp Thr Tyr Asp Pro Glu Arg Glu Gly Ala
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 Ile Ala Thr Arg Ser Gly Gly Phe Leu His Asp Ala Ala Glu Phe Asp
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 Pro Glu Phe Phe Gly Met Ser Pro Arg Glu Ala Leu Thr Thr Asp Ala
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 Gly Val Met Tyr His Asp Tyr Ser Thr Leu Leu Ser Gly Arg Glu Phe
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 Val Ser Tyr Thr Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr
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Arg Ser Gly Glu Cys Ser Leu Ala Leu Ala Gly Gly Val Thr Val Met
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Ser Thr Pro Leu Thr Phe Val Glu Phe Ser Arg Gln Gly Gly Leu Ser
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Trp Ala Glu Gly Ala Gly Ile Leu Val Leu Glu Arg Leu Ser Asp Ala
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Arg Arg Asn Gly His Arg Ile Leu Ala Thr Val Arg Gly Ser Ala Val
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Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ala
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Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Ser Ala Gly Leu Ser Ala
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Pro Glu Asp Arg Pro Leu Leu Leu Gly Ser Val Lys Ser Asn Ile Gly
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His Ala Gln Ala Ala Ser Gly Val Ala Gly Val Ile Lys Met Val Leu
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Ala Met Arg His Gly Val Leu Pro Arg Thr Leu His Val Asp Glu Pro
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Ser Ser His Val Asp Trp Ser Ala Gly Ala Val Glu Leu Leu Thr Ser
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Glu Pro Val Ala Ala Glu Thr Glu Ser Ile Thr Pro Asp Thr Ala Pro
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Asp Ala Ala Glu Asp Glu Ala Ala Asp Ser Gly Thr Pro Val Pro Ala
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Ala Tyr Ser Leu Ala Thr Gly Arg Ser Ala Phe Pro His Arg Ala Val
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Gly Tyr Ala Gln Thr Gly Leu Phe Ala Ile Glu Val Ala Leu Phe Arg
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Ile Gly Glu Ile Ala Ala Ala His Val Ala Gly Val Leu Ser Leu Pro
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Asp Ala Cys Ala Leu Val Ala Ala Arg Gly Arg Leu Met Gln Gln Leu
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Pro Ser Gly Gly Ala Met Met Ala Ile Arg Ala Thr Glu Asp Glu Val
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Leu Pro His Leu Ala Glu Gly Val Ser Leu Ala Ala Val Asn Gly Pro
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Ser Ser Val Val Val Ser Gly Ala Glu Asp Glu Val Leu Ala Leu Ala
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Ala His Phe Glu Glu Glu Gly Arg Lys Thr Thr Arg Leu Arg Val Ser
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His Ala Phe His Ser Pro Leu Met Glu Pro Met Leu Ala Asp Phe Arg
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Ser Asn Val Thr Gly Arg Pro Ala Thr Ala Glu Glu Leu Cys Cys Ala
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Val Gly Ala Leu Arg Glu Gln Gly Val Thr Thr Phe Leu Glu Leu Gly
5795 5800 5805
Pro Asp Gly Ser Leu Ser Ala Leu Ala Ala Glu Ser Ala Ala Asp Asp
5810 5815 5820
Ser Val Leu Ala Pro Val Leu Arg Lys Asn Arg Pro Glu Ala Pro Ala
5825 5830 5835 5840
Leu Leu Thr Ala Leu Ala Arg Leu His Ala Gln Gly Thr Pro Val Asp
5845 5850 5855
Trp Ser Ala Ala Phe Ala Gly Thr Gly Ala Arg Trp Val Asp Leu Pro
5860 5865 5870
Thr Tyr Ala Phe Gln His Glu Arg Phe Trp Pro Ser Gly Gly Ala Ala
5875 5880 5885
Arg Ala Gly Asp Val Arg Ser Ala Gly Leu Gly Ser Ala Gly His Pro
5890 5895 5900
Leu Leu Gly Ala Ala Val Glu Leu Ala Gly Ser Gly Gly Arg Leu Leu
5905 5910 5915 5920
Thr Gly Arg Leu Ser Leu Ser Ser His Pro Trp Leu Ala Asp His Val
5925 5930 5935
Val Leu Gly Ser Val Leu Val Pro Gly Thr Ala Leu Met Glu Leu Val
5940 5945 5950
Leu Arg Ala Ala Asp Glu Val Asp Cys Ala Ala Val Asp Glu Leu Thr
5955 5960 5965
Leu Ala Ala Pro Leu Val Leu Pro Ala Ser Gly Ala Ala Ile Gln Val
5970 5975 5980
Gln Val Trp Val Gly Glu Pro Asp Glu Ala Gly Arg Arg Pro Val Ser
5985 5990 5995 6000
Val His Ala Arg Glu Gly Glu Gly Pro Trp Thr Leu His Ala Asp Gly
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Ala Leu Ala Pro Ala Ala Glu Thr Val Pro Phe Asp Thr Ala Ile Trp
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Pro Pro Gln Gly Ala Glu His Leu Asp Ala Ala Gly Cys Tyr Glu Arg
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Phe Ala Asp Ala Gly Phe Ala Tyr Gly Pro Val Phe Gln Gly Leu Arg
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Glu Gly Thr Asp Gly Asn Ala Tyr Gly Leu His Pro Ala Leu Phe Asp
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Ala Val Pro Phe Ser Trp Asn Gly Val Thr Leu His Ala Thr Gly Ala
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Ser Arg Val Arg Val Arg Ile Arg Pro Thr Glu Gly Gly Thr Ser Ile
 6130 6135 6140

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Thr Ala Arg Pro Ile Thr Ala Gly Gln Leu Gln Thr Gly Asp Arg Asp
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Ser Leu Phe Gln Val Asp Trp Thr Thr Leu His Leu Thr Asp Glu Arg
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Ala Asn Ser Leu Ala Leu Leu Gly Lys Asp Thr Glu Gly Ile Leu Asp
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Thr Leu Ser Leu Gln Pro His Ala Asp Leu Asp Asp Leu Ala Ala Thr
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Gly Val His Asp Thr Val Leu Ala Pro Leu Pro Thr Arg Thr Ala Gly
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Thr Val Glu Ser Val His Ala Ala Thr Thr Gly Ala Leu Ala Leu Ile
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Arg Ser Trp Leu Ala Asp Asp Arg Phe Ala Ala Ser Arg Leu Val Phe
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Val Thr Arg Gly Ala Val Ser Gly Thr Asp Leu Ala Gly Ala Ser Val
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Trp Gly Leu Val Arg Ser Ala Leu Leu Glu His Pro Gly Arg Phe Gly
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Leu Val Asp Val Asp Val Asp Gln Asp Ala Glu Val Pro Leu Val Pro
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Arg Ala Leu Ala Ser Asp Glu Pro Gln Val Leu Val Arg Gly Gly Glu
 6325 6330 6335

Val Leu Ala Ala Arg Leu Val Arg Ala Gln Ser Ser Asp Thr Val Thr
 6340 6345 6350

Trp Asp Pro Ser Gly Thr Val Leu Ile Thr Gly Gly Thr Gly Gly Leu
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Gly Arg Ser Val Ala Arg His Leu Val Ser Glu His Gly Val Arg Ser
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 Cys Asp Val Thr Asp Ala Val Ala Val Ala Asp Leu Val Ala Arg His
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 Arg Ile Ser Ala Val Val His Thr Ala Gly Val Leu Asp Asp Gly Val
 6435 6440 6445
 Val Glu Ser Leu Thr Pro Glu Arg Leu Ser Ala Val Leu Arg Pro Lys
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 Pro Trp Ser Gln Asp Gly Gly Met Thr Gly Thr Leu Ser Asp Ala Asp
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 Gln Pro Leu Leu Arg Gly Leu Ile Arg Thr Pro Gly Arg Arg Thr Ala
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 Asp Gln Asp Arg Ala Phe Leu Asp Leu Gly Phe Asp Ser Leu Thr Ala
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 Val Glu Leu Arg Asn Arg Leu Gly Ala Val Thr Gly Ile Arg Leu Pro
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 Ala Thr Leu Leu Phe Asp Tyr Pro Thr Pro Ala Glu Leu Val Ala His
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Leu His Ala Arg Ile Ala Pro Glu Pro Thr Val Gly Pro Glu Ala Leu
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Leu Gly Glu Leu Glu Arg Met Glu Lys Ser Phe Gly Gly Leu Asp Leu
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Thr Glu Glu Met His Glu Gln Ile Ala Gly Arg Leu Glu Val Leu Arg
6740 6745 6750

Ala Lys Trp Asp Ala Leu Arg Asp Thr Ala Ala Ala Gly His Asp
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Gly Ser Pro Ser Asp Glu Asp Phe Asp Phe Glu Ser Ala Ser Asp Asp
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Glu Val Phe Asp Leu Leu Asp Asn Glu Leu Gly Leu Ser
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gcc ctc ggc ggc gcc gca gcc gcc gga atg acc acg atc acc tcc gcc 96
Ala Leu Gly Gly Ala Ala Ala Ala Gly Met Thr Thr Ile Thr Ser Ala
20 25 30
cct cat gcc gcg gcc gcc gac cgg cgc agt ccg cag gcc cgc agc ggc 144
Pro His Ala Ala Ala Ala Asp Arg Arg Ser Pro Gln Ala Arg Ser Gly
35 40 45
tcg ttc gta ccg gcc gtg gtg atc ggt acg gga tac ggc gcc gcg gtc 192
Ser Phe Val Pro Ala Val Val Ile Gly Thr Gly Tyr Gly Ala Ala Val
50 55 60
tcc gcg ctg cgg ctc ggc gag gcc gga att ccc acg ctc atg ctc gaa 240
Ser Ala Leu Arg Leu Gly Glu Ala Gly Ile Pro Thr Leu Met Leu Glu
65 70 75 80
atg ggc cag ctg tgg aac aag ccc gcc gac gac ggc aac gtc ttc tgc 288
Met Gly Gln Leu Trp Asn Lys Pro Ala Asp Asp Gly Asn Val Phe Cys
85 90 95
gga atg ctc tcg ccc gac cgc cgc tcc agc tgg ttc aag tcc cgc acc 336
Gly Met Leu Ser Pro Asp Arg Arg Ser Ser Trp Phe Lys Ser Arg Thr

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gag gcc ccg ctc ggc tcg ttc ctg tgg ctg gat gtg atc aac cgc gac Glu Ala Pro Leu Gly Ser Phe Leu Trp Leu Asp Val Ile Asn Arg Asp 115 120 125			384
atc gac ccg tac gcg gga gtg ctg gac aag gtg cac ttc gac cag atg Ile Asp Pro Tyr Ala Gly Val Leu Asp Lys Val His Phe Asp Gln Met 130 135 140			432
tcg gtg tac gtg ggg cgg ggt gtc ggc ggc ggc tcg ctg gtc aac ggc Ser Val Tyr Val Gly Arg Gly Val Gly Gly Gly Ser Leu Val Asn Gly 145 150 155 160			480
ggg atg gcc gtc gta ccg aag cgc tcg tac ttc gag gag gtc ctc ccg Gly Met Ala Val Val Pro Lys Arg Ser Tyr Phe Glu Glu Val Leu Pro 165 170 175			528
cgg gtg gac gcc gcc gag atg tac gac cgg tac ttc ccg cgc gcc aac Arg Val Asp Ala Ala Glu Met Tyr Asp Arg Tyr Phe Pro Arg Ala Asn 180 185 190			576
tcc atg ctc aag gtg aac cac atc gac aag ggg tgg ttc gag gag acg Ser Met Leu Lys Val Asn His Ile Asp Lys Gly Trp Phe Glu Glu Thr 195 200 205			624
gag tgg tac aag ttc gcg cgg gtc tcg cgc gag cag gcg ggc aag gcg Glu Trp Tyr Lys Phe Ala Arg Val Ser Arg Glu Gln Ala Gly Lys Ala 210 215 220			672
ggc ctg ggc acc acc ttc gtc ccc aac gtc tac gac ttc gac tac atg Gly Leu Gly Thr Thr Phe Val Pro Asn Val Tyr Asp Phe Asp Tyr Met 225 230 235 240			720
cgg cgc gag gcg aac ggt gag tcg ccc aag tcc gcg ctg gcg acc gag Arg Arg Glu Ala Asn Gly Glu Ser Pro Lys Ser Ala Leu Ala Thr Glu 245 250 255			768
gtc atc tac ggc aac aac cac ggc aaa cag agc ctg gac aag acc tac Val Ile Tyr Gly Asn Asn His Gly Lys Gln Ser Leu Asp Lys Thr Tyr 260 265 270			816
ctg gcc gcc gcg ctc ggc acc ggc aag gtc acc atc gag acc ctg cac Leu Ala Ala Ala Leu Gly Thr Gly Lys Val Thr Ile Glu Thr Leu His 275 280 285			864
cag gtc agg gcg atc cac cag cag ccg gac ggc agc tac gtg ctg tcc Gln Val Arg Ala Ile His Gln Gln Pro Asp Gly Ser Tyr Val Leu Ser 290 295 300			912
gtg gac cag atc gac acg gcc ggc cag acc gtc gcc cac aag gag atc Val Asp Gln Ile Asp Thr Ala Gly Gln Thr Val Ala His Lys Glu Ile 305 310 315 320			960
tcc tgc cgt cac ctg ttc ctc ggc gcc ggc agc ctc ggc tcc acc gaa Ser Cys Arg His Leu Phe Leu Gly Ala Gly Ser Leu Gly Ser Thr Glu 325 330 335			1008

ctg ctg gtg cgc gcc cgg gac acc ggc gcg ctg ccc gac ctc aac gcc	1056
Leu Leu Val Arg Ala Arg Asp Thr Gly Ala Leu Pro Asp Leu Asn Ala	
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gag gtc ggc gcg ggc tgg ggc ccc aac ggc aac atc atg acc ggc cgg	1104
Glu Val Gly Ala Gly Trp Gly Pro Asn Gly Asn Ile Met Thr Gly Arg	
355 360 365	
gcc aac cac gtc tgg aac ccc acc ggg gcc cac cag tcc tcg atc ccc	1152
Ala Asn His Val Trp Asn Pro Thr Gly Ala His Gln Ser Ser Ile Pro	
370 375 380	
gct ctg ggc atc gac gac tgg aac aac ccc acc gcc ccg gtc ttc gcc	1200
Ala Leu Gly Ile Asp Asp Trp Asn Asn Pro Thr Ala Pro Val Phe Ala	
385 390 395 400	
gaa atc gcc ccg atg ccc gcc ggg ttg gag acc tgg gtc agc ctc tat	1248
Glu Ile Ala Pro Met Pro Ala Gly Leu Glu Thr Trp Val Ser Leu Tyr	
405 410 415	
ctg gcg atc acc aag aac ccc gag cgc ggc acc ttc gtc tac gac aag	1296
Leu Ala Ile Thr Lys Asn Pro Glu Arg Gly Thr Phe Val Tyr Asp Lys	
420 425 430	
gcc acc gac cgg gcc gcg ctg cgc tgg acg cgg gac cag aac acg ccc	1344
Ala Thr Asp Arg Ala Ala Leu Arg Trp Thr Arg Asp Gln Asn Thr Pro	
435 440 445	
gcg gtc aac gcc gcc agg tcg ctc ttc gac cgc atc aac aag gcc aac	1392
Ala Val Asn Ala Ala Arg Ser Leu Phe Asp Arg Ile Asn Lys Ala Asn	
450 455 460	
ggc acg atg tac cgc tac gac ctg ttc ggg ccg cag ctg aag aac ttc	1440
Gly Thr Met Tyr Arg Tyr Asp Leu Phe Gly Pro Gln Leu Lys Asn Phe	
465 470 475 480	
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Ser Asp Asp Phe Cys Tyr His Pro Leu Gly Gly Cys Val Leu Gly Lys	
485 490 495	
gcc acc gac ggg tac ggc cgg gtc gcc ggc tac cac aac ctc tac gtc	1536
Ala Thr Asp Gly Tyr Gly Arg Val Ala Gly Tyr His Asn Leu Tyr Val	
500 505 510	
acg gac ggc gcg ctc atc ccg ggg tcc atc ggg gtc aac ccc ttc gtg	1584
Thr Asp Gly Ala Leu Ile Pro Gly Ser Ile Gly Val Asn Pro Phe Val	
515 520 525	
acc atc acg gcg ctg gcc gag cgg aac atc gag cgg atc atc gcg gag	1632
Thr Ile Thr Ala Leu Ala Glu Arg Asn Ile Glu Arg Ile Ile Ala Glu	
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 35 40 45
 Ser Phe Val Pro Ala Val Val Ile Gly Thr Gly Tyr Gly Ala Ala Val
 50 55 60
 Ser Ala Leu Arg Leu Gly Glu Ala Gly Ile Pro Thr Leu Met Leu Glu
 65 70 75 80
 Met Gly Gln Leu Trp Asn Lys Pro Ala Asp Asp Gly Asn Val Phe Cys
 85 90 95
 Gly Met Leu Ser Pro Asp Arg Arg Ser Ser Trp Phe Lys Ser Arg Thr
 100 105 110
 Glu Ala Pro Leu Gly Ser Phe Leu Trp Leu Asp Val Ile Asn Arg Asp
 115 120 125
 Ile Asp Pro Tyr Ala Gly Val Leu Asp Lys Val His Phe Asp Gln Met
 130 135 140
 Ser Val Tyr Val Gly Arg Gly Val Gly Gly Gly Ser Leu Val Asn Gly
 145 150 155 160
 Gly Met Ala Val Val Pro Lys Arg Ser Tyr Phe Glu Glu Val Leu Pro
 165 170 175
 Arg Val Asp Ala Ala Glu Met Tyr Asp Arg Tyr Phe Pro Arg Ala Asn
 180 185 190
 Ser Met Leu Lys Val Asn His Ile Asp Lys Gly Trp Phe Glu Glu Thr
 195 200 205
 Glu Trp Tyr Lys Phe Ala Arg Val Ser Arg Glu Gln Ala Gly Lys Ala
 210 215 220
 Gly Leu Gly Thr Thr Phe Val Pro Asn Val Tyr Asp Phe Asp Tyr Met
 225 230 235 240
 Arg Arg Glu Ala Asn Gly Glu Ser Pro Lys Ser Ala Leu Ala Thr Glu
 245 250 255
 Val Ile Tyr Gly Asn Asn His Gly Lys Gln Ser Leu Asp Lys Thr Tyr
 260 265 270

Leu Ala Ala Ala Leu Gly Thr Gly Lys Val Thr Ile Glu Thr Leu His
 275 280 285
 Gln Val Arg Ala Ile His Gln Gln Pro Asp Gly Ser Tyr Val Leu Ser
 290 295 300
 Val Asp Gln Ile Asp Thr Ala Gly Gln Thr Val Ala His Lys Glu Ile
 305 310 315 320
 Ser Cys Arg His Leu Phe Leu Gly Ala Gly Ser Leu Gly Ser Thr Glu
 325 330 335
 Leu Leu Val Arg Ala Arg Asp Thr Gly Ala Leu Pro Asp Leu Asn Ala
 340 345 350
 Glu Val Gly Ala Gly Trp Gly Pro Asn Gly Asn Ile Met Thr Gly Arg
 355 360 365
 Ala Asn His Val Trp Asn Pro Thr Gly Ala His Gln Ser Ser Ile Pro
 370 375 380
 Ala Leu Gly Ile Asp Asp Trp Asn Asn Pro Thr Ala Pro Val Phe Ala
 385 390 395 400
 Glu Ile Ala Pro Met Pro Ala Gly Leu Glu Thr Trp Val Ser Leu Tyr
 405 410 415
 Leu Ala Ile Thr Lys Asn Pro Glu Arg Gly Thr Phe Val Tyr Asp Lys
 420 425 430
 Ala Thr Asp Arg Ala Ala Leu Arg Trp Thr Arg Asp Gln Asn Thr Pro
 435 440 445
 Ala Val Asn Ala Ala Arg Ser Leu Phe Asp Arg Ile Asn Lys Ala Asn
 450 455 460
 Gly Thr Met Tyr Arg Tyr Asp Leu Phe Gly Pro Gln Leu Lys Asn Phe
 465 470 475 480
 Ser Asp Asp Phe Cys Tyr His Pro Leu Gly Gly Cys Val Leu Gly Lys
 485 490 495
 Ala Thr Asp Gly Tyr Gly Arg Val Ala Gly Tyr His Asn Leu Tyr Val
 500 505 510
 Thr Asp Gly Ala Leu Ile Pro Gly Ser Ile Gly Val Asn Pro Phe Val
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 Asp Phe Pro Gln Arg Lys Pro Gly Val Pro Phe Pro Pro Pro Asp Tyr
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 gcc gac tac cgc gac cgg aag ggg ctc gtc ctc tcg cag ctg tcc gac 144
 Ala Asp Tyr Arg Asp Arg Lys Gly Leu Val Leu Ser Gln Leu Ser Asp
 35 40 45
 ggc aaa cgg gta tgg ctg gtc acc cgg cac gag gac gta cgc gcc gta 192
 Gly Lys Arg Val Trp Leu Val Thr Arg His Glu Asp Val Arg Ala Val
 50 55 60
 ctg acc agc ccg agc atc agc tcg aac ccc gag cac aag gga ttt ccc 240
 Leu Thr Ser Pro Ser Ile Ser Ser Asn Pro Glu His Lys Gly Phe Pro
 65 70 75 80
 aac gtc ggg aac ctg ggt gtg ccc aag cag gac cag atc ccg ggc tgg 288
 Asn Val Gly Asn Leu Gly Val Pro Lys Gln Asp Gln Ile Pro Gly Trp
 85 90 95
 ttc gtg ggc atg gac tcc ccc gag cac gac cgg ttc cgc aag gcc ctc 336
 Phe Val Gly Met Asp Ser Pro Glu His Asp Arg Phe Arg Lys Ala Leu
 100 105 110
 atc ccg gag ttc acc gtc cgg cgg gta cgc gcg atg aag ccc gcg atc 384
 Ile Pro Glu Phe Thr Val Arg Arg Val Arg Ala Met Lys Pro Ala Ile
 115 120 125
 gaa cgc acg gtg gac gcc caa ctg gac gcc atg ctg gcc gcg ggc aac 432
 Glu Arg Thr Val Asp Ala Gln Leu Asp Ala Met Leu Ala Ala Gly Asn
 130 135 140
 acc gcc gac ctc gtc gcc gac ttc gcc ctg ccc atc ccc tcc ctg gtg 480
 Thr Ala Asp Leu Val Ala Asp Phe Ala Leu Pro Ile Pro Ser Leu Val
 145 150 155 160
 atc tcc gca ctg ctc ggc gtg ccg ccc gcc gac cgc gag ttc ttc gag 528
 Ile Ser Ala Leu Leu Gly Val Pro Pro Ala Asp Arg Glu Phe Phe Glu
 165 170 175
 tcc agg acc cgc gtc ctg gtc tcc ctc cgc tcc tcc acc gac gac gac 576
 Ser Arg Thr Arg Val Leu Val Ser Leu Arg Ser Ser Thr Asp Asp Asp
 180 185 190

cgg atg gcc gcc gcc aag gac ctc ctg cgg tac atc aac cgg ctc gtg	624
Arg Met Ala Ala Ala Lys Asp Leu Leu Arg Tyr Ile Asn Arg Leu Val	
195 200 205	
 gag atc aaa cag aag tgg ggc ggc gac gac ctc atc acc cgg ctg ctg	672
Glu Ile Lys Gln Lys Trp Gly Gly Asp Asp Leu Ile Thr Arg Leu Leu	
210 215 220	
 gcc acc ggt gcc atc gcc ccc cac gaa atg tcc ggc gtg ctg atg ctc	720
Ala Thr Gly Ala Ile Ala Pro His Glu Met Ser Gly Val Leu Met Leu	
225 230 235 240	
 ctg ctc atc gcc ggc cac gag acc acg gcc aac aac atc gcc ctc ggc	768
Leu Leu Ile Ala Gly His Glu Thr Thr Ala Asn Asn Ile Ala Leu Gly	
245 250 255	
 gtg gtc acc ctg ctg gcg aac ccc caa tgg atc ggc gac gac cgg gcc	816
Val Val Thr Leu Leu Ala Asn Pro Gln Trp Ile Gly Asp Asp Arg Ala	
260 265 270	
 gtg gag gag acc ctg cgc ttc cac tcc gtc gcc gac ctg gtg tcc ctg	864
Val Glu Glu Thr Leu Arg Phe His Ser Val Ala Asp Leu Val Ser Leu	
275 280 285	
 cgc gtc gcg gtc cag gac gtg gaa atc gcc ggg cag ctc atc aag gcg	912
Arg Val Ala Val Gln Asp Val Glu Ile Ala Gly Gln Leu Ile Lys Ala	
290 295 300	
 ggc gag gga atc gtg ccg ctg gtc gcc gcc gcc aat cat gac gag aac	960
Gly Glu Gly Ile Val Pro Leu Val Ala Ala Ala Asn His Asp Glu Asn	
305 310 315 320	
 gcc ttc gaa tgc ccc cac gcc ttc gac ccg tcc cgg tcc gcc cgc cac	1008
Ala Phe Glu Cys Pro His Ala Phe Asp Pro Ser Arg Ser Ala Arg His	
325 330 335	
 cat gtg gcc ttc ggc tac ggc gta cac caa tgc ctg gga cag aac ctg	1056
His Val Ala Phe Gly Tyr Gly Val His Gln Cys Leu Gly Gln Asn Leu	
340 345 350	
 gtg cgg atc gag atg gaa gtc gcg tac cgg aaa ctc ttc gag cgc atc	1104
Val Arg Ile Glu Met Glu Val Ala Tyr Arg Lys Leu Phe Glu Arg Ile	
355 360 365	
 ccg aac ctc gaa ctc gcc gtg ccc acc gac ggg ttg gac atc aag tac	1152
Pro Asn Leu Glu Leu Ala Val Pro Thr Asp Gly Leu Asp Ile Lys Tyr	
370 375 380	
 gac ggc gtg ctc tac ggc ctg aac gag ctg ccc gtc cgc tgg tag	1197
Asp Gly Val Leu Tyr Gly Leu Asn Glu Leu Pro Val Arg Trp	
385 390 395	

<210> 8
 <211> 398
 <212> PRT

<213> Streptomyces natalensis

<400> 8

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Asp	Phe	Pro	Gln	Arg	Lys	Pro	Gly	Val	Pro	Phe	Pro	Pro	Pro	Asp	Tyr
			20					25					30		
Ala	Asp	Tyr	Arg	Asp	Arg	Lys	Gly	Leu	Val	Leu	Ser	Gln	Leu	Ser	Asp
		35					40					45			
Gly	Lys	Arg	Val	Trp	Leu	Val	Thr	Arg	His	Glu	Asp	Val	Arg	Ala	Val
	50					55					60				
Leu	Thr	Ser	Pro	Ser	Ile	Ser	Ser	Asn	Pro	Glu	His	Lys	Gly	Phe	Pro
65					70					75					80
Asn	Val	Gly	Asn	Leu	Gly	Val	Pro	Lys	Gln	Asp	Gln	Ile	Pro	Gly	Trp
				85					90					95	
Phe	Val	Gly	Met	Asp	Ser	Pro	Glu	His	Asp	Arg	Phe	Arg	Lys	Ala	Leu
			100					105					110		
Ile	Pro	Glu	Phe	Thr	Val	Arg	Arg	Val	Arg	Ala	Met	Lys	Pro	Ala	Ile
		115					120					125			
Glu	Arg	Thr	Val	Asp	Ala	Gln	Leu	Asp	Ala	Met	Leu	Ala	Ala	Gly	Asn
	130					135					140				
Thr	Ala	Asp	Leu	Val	Ala	Asp	Phe	Ala	Leu	Pro	Ile	Pro	Ser	Leu	Val
145					150					155					160
Ile	Ser	Ala	Leu	Leu	Gly	Val	Pro	Pro	Ala	Asp	Arg	Glu	Phe	Phe	Glu
			165						170					175	
Ser	Arg	Thr	Arg	Val	Leu	Val	Ser	Leu	Arg	Ser	Ser	Thr	Asp	Asp	Asp
			180					185					190		
Arg	Met	Ala	Ala	Ala	Lys	Asp	Leu	Leu	Arg	Tyr	Ile	Asn	Arg	Leu	Val
		195					200					205			
Glu	Ile	Lys	Gln	Lys	Trp	Gly	Gly	Asp	Asp	Leu	Ile	Thr	Arg	Leu	Leu
	210					215					220				
Ala	Thr	Gly	Ala	Ile	Ala	Pro	His	Glu	Met	Ser	Gly	Val	Leu	Met	Leu
225					230					235					240
Leu	Leu	Ile	Ala	Gly	His	Glu	Thr	Thr	Ala	Asn	Asn	Ile	Ala	Leu	Gly
			245						250					255	
Val	Val	Thr	Leu	Leu	Ala	Asn	Pro	Gln	Trp	Ile	Gly	Asp	Asp	Arg	Ala
			260					265					270		
Val	Glu	Glu	Thr	Leu	Arg	Phe	His	Ser	Val	Ala	Asp	Leu	Val	Ser	Leu
		275					280					285			

Arg Val Ala Val Gln Asp Val Glu Ile Ala Gly Gln Leu Ile Lys Ala
 290 295 300

Gly Glu Gly Ile Val Pro Leu Val Ala Ala Ala Asn His Asp Glu Asn
 305 310 315 320

Ala Phe Glu Cys Pro His Ala Phe Asp Pro Ser Arg Ser Ala Arg His
 325 330 335

His Val Ala Phe Gly Tyr Gly Val His Gln Cys Leu Gly Gln Asn Leu
 340 345 350

Val Arg Ile Glu Met Glu Val Ala Tyr Arg Lys Leu Phe Glu Arg Ile
 355 360 365

Pro Asn Leu Glu Leu Ala Val Pro Thr Asp Gly Leu Asp Ile Lys Tyr
 370 375 380

Asp Gly Val Leu Tyr Gly Leu Asn Glu Leu Pro Val Arg Trp
 385 390 395

<210> 9

<211> 1194

<212> DNA

<213> Streptomyces natalensis

<220>

<221> CDS

<222> (1)..(1194)

<223> ORF3

<400> 9

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aaa atg ctg aaa ctg agc ccg ctg ctg cgc gcc ttg cag gac cgg ggg 96
 Lys Met Leu Lys Leu Ser Pro Leu Leu Arg Ala Leu Gln Asp Arg Gly
 20 25 30

ccg atc cac cgg gtg cgc aca ccc gcc ggg gac gag gcg tgg ctg gtg 144
 Pro Ile His Arg Val Arg Thr Pro Ala Gly Asp Glu Ala Trp Leu Val
 35 40 45

acc cgc cac gcc gag ctc aag cag ctg ctg cac gac gag cgc atc ggc 192
 Thr Arg His Ala Glu Leu Lys Gln Leu Leu His Asp Glu Arg Ile Gly
 50 55 60

cgc acg cac ccc gac ccg ccc tcc gcc gcc cag tac gta cgc agc ccc 240
 Arg Thr His Pro Asp Pro Pro Ser Ala Ala Gln Tyr Val Arg Ser Pro
 65 70 75 80

ttc ctg gac ctg ctg atc agc gac gcc gac gcc gag tcc ggg cgt cgg 288
 Phe Leu Asp Leu Leu Ile Ser Asp Ala Asp Ala Glu Ser Gly Arg Arg
 85 90 95

cag cac gcc gag acc cgc cgc ctg ctc act ccg ttg ttc tgc gcc cgg	336
Gln His Ala Glu Thr Arg Arg Leu Leu Thr Pro Leu Phe Ser Ala Arg	
100 105 110	
cgc gtt ctg gaa atg cag ccg aag gtg gag gag gcc gcg gac acc ctg	384
Arg Val Leu Glu Met Gln Pro Lys Val Glu Glu Ala Ala Asp Thr Leu	
115 120 125	
ctg gac gcg ttc atc gcc cag ggg cct ccc ggc gac ctg cac ggc gag	432
Leu Asp Ala Phe Ile Ala Gln Gly Pro Pro Gly Asp Leu His Gly Glu	
130 135 140	
ctc acc gtg ccg ttc gcc ctc acg gtc ctc tgc gag gtc atc ggc gtg	480
Leu Thr Val Pro Phe Ala Leu Thr Val Leu Cys Glu Val Ile Gly Val	
145 150 155 160	
ccg ccg cag cgc cgc gcg gag ctg acc aca ctg ctg gcc ggt atc gcc	528
Pro Pro Gln Arg Arg Ala Glu Leu Thr Thr Leu Leu Ala Gly Ile Ala	
165 170 175	
aag ctg gac gac cgc gag ggc gcc gta cgg gca cag gac gac ctg ttc	576
Lys Leu Asp Asp Arg Glu Gly Ala Val Arg Ala Gln Asp Asp Leu Phe	
180 185 190	
ggg tac gtg gca ggg ctg gtc gag cac aag cgg gcc gag ccc ggc cca	624
Gly Tyr Val Ala Gly Leu Val Glu His Lys Arg Ala Glu Pro Gly Pro	
195 200 205	
gac atc atc tcc cgg ctg aac gac ggc gag ctg acc gag gac cgc gtg	672
Asp Ile Ile Ser Arg Leu Asn Asp Gly Glu Leu Thr Glu Asp Arg Val	
210 215 220	
gca cac ctg gcc atg ggc ctg ctg ttc gcc ggg ctg gac agc gtc gcg	720
Ala His Leu Ala Met Gly Leu Leu Phe Ala Gly Leu Asp Ser Val Ala	
225 230 235 240	
agc atc atg gac aac ggg gtg gtg ctg ctg gcc gcc cac ccc gat cag	768
Ser Ile Met Asp Asn Gly Val Val Leu Leu Ala Ala His Pro Asp Gln	
245 250 255	
cgc gcg gcg gcg ctg gcc gac ccc gac gtg atg gcg cgt gcc gtg gag	816
Arg Ala Ala Ala Leu Ala Asp Pro Asp Val Met Ala Arg Ala Val Glu	
260 265 270	
gag gtg ctg cgg acc gcc cgg gcc ggc ggg tgc gtc ctg ccg ccg cgc	864
Glu Val Leu Arg Thr Ala Arg Ala Gly Gly Ser Val Leu Pro Pro Arg	
275 280 285	
tac gcc agc gag gac atg gaa ttc ggc ggg gtg acg ata cgg gcc gga	912
Tyr Ala Ser Glu Asp Met Glu Phe Gly Gly Val Thr Ile Arg Ala Gly	
290 295 300	
gac ctg gtc ctg ttc gac ctc ggc ctg ccc aac ttc gac gag cgg gcg	960
Asp Leu Val Leu Phe Asp Leu Gly Leu Pro Asn Phe Asp Glu Arg Ala	
305 310 315 320	
ttc aca ggg ccg gag gaa ttc gac gcc gcc agg acc ccc aat ccc cat	1008

Phe Thr Gly Pro Glu Glu Phe Asp Ala Ala Arg Thr Pro Asn Pro His
325 330 335
ctg acc ttc ggc cac ggc atc tgg cac tgc atc ggc gcc ccc ctc gcg 1056
Leu Thr Phe Gly His Gly Ile Trp His Cys Ile Gly Ala Pro Leu Ala
340 345 350
cgc ctg gaa ctc agg acg atg ttc acc aag ctg ttc acc cgc ctg ccg 1104
Arg Leu Glu Leu Arg Thr Met Phe Thr Lys Leu Phe Thr Arg Leu Pro
355 360 365
gaa ctg cgc ccg gaa ctt ccg gtg gag caa ctg cgc ctg aag gag ggc 1152
Glu Leu Arg Pro Glu Leu Pro Val Glu Gln Leu Arg Leu Lys Glu Gly
370 375 380
cag ctg tcg ggc ggc ttc gcc gag ctc cgg gtg gtc tgg tag 1194
Gln Leu Ser Gly Gly Phe Ala Glu Leu Arg Val Val Trp
385 390 395

<210> 10
<211> 397
<212> PRT
<213> Streptomyces natalensis

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Lys Met Leu Lys Leu Ser Pro Leu Leu Arg Ala Leu Gln Asp Arg Gly
20 25 30
Pro Ile His Arg Val Arg Thr Pro Ala Gly Asp Glu Ala Trp Leu Val
35 40 45
Thr Arg His Ala Glu Leu Lys Gln Leu Leu His Asp Glu Arg Ile Gly
50 55 60
Arg Thr His Pro Asp Pro Pro Ser Ala Ala Gln Tyr Val Arg Ser Pro
65 70 75 80
Phe Leu Asp Leu Leu Ile Ser Asp Ala Asp Ala Glu Ser Gly Arg Arg
85 90 95
Gln His Ala Glu Thr Arg Arg Leu Leu Thr Pro Leu Phe Ser Ala Arg
100 105 110
Arg Val Leu Glu Met Gln Pro Lys Val Glu Glu Ala Ala Asp Thr Leu
115 120 125
Leu Asp Ala Phe Ile Ala Gln Gly Pro Pro Gly Asp Leu His Gly Glu
130 135 140
Leu Thr Val Pro Phe Ala Leu Thr Val Leu Cys Glu Val Ile Gly Val
145 150 155 160
Pro Pro Gln Arg Arg Ala Glu Leu Thr Thr Leu Leu Ala Gly Ile Ala

165					170					175					
Lys	Leu	Asp	Asp	Arg	Glu	Gly	Ala	Val	Arg	Ala	Gln	Asp	Asp	Leu	Phe
			180					185					190		
Gly	Tyr	Val	Ala	Gly	Leu	Val	Glu	His	Lys	Arg	Ala	Glu	Pro	Gly	Pro
		195					200					205			
Asp	Ile	Ile	Ser	Arg	Leu	Asn	Asp	Gly	Glu	Leu	Thr	Glu	Asp	Arg	Val
	210					215					220				
Ala	His	Leu	Ala	Met	Gly	Leu	Leu	Phe	Ala	Gly	Leu	Asp	Ser	Val	Ala
225						230					235				240
Ser	Ile	Met	Asp	Asn	Gly	Val	Val	Leu	Leu	Ala	Ala	His	Pro	Asp	Gln
				245					250					255	
Arg	Ala	Ala	Ala	Leu	Ala	Asp	Pro	Asp	Val	Met	Ala	Arg	Ala	Val	Glu
			260					265					270		
Glu	Val	Leu	Arg	Thr	Ala	Arg	Ala	Gly	Gly	Ser	Val	Leu	Pro	Pro	Arg
		275					280					285			
Tyr	Ala	Ser	Glu	Asp	Met	Glu	Phe	Gly	Gly	Val	Thr	Ile	Arg	Ala	Gly
	290					295					300				
Asp	Leu	Val	Leu	Phe	Asp	Leu	Gly	Leu	Pro	Asn	Phe	Asp	Glu	Arg	Ala
305						310					315				320
Phe	Thr	Gly	Pro	Glu	Glu	Phe	Asp	Ala	Ala	Arg	Thr	Pro	Asn	Pro	His
				325					330					335	
Leu	Thr	Phe	Gly	His	Gly	Ile	Trp	His	Cys	Ile	Gly	Ala	Pro	Leu	Ala
			340					345					350		
Arg	Leu	Glu	Leu	Arg	Thr	Met	Phe	Thr	Lys	Leu	Phe	Thr	Arg	Leu	Pro
		355					360					365			
Glu	Leu	Arg	Pro	Glu	Leu	Pro	Val	Glu	Gln	Leu	Arg	Leu	Lys	Glu	Gly
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Gln	Leu	Ser	Gly	Gly	Phe	Ala	Glu	Leu	Arg	Val	Val	Trp			
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<210> 11

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Forward primer
ermE promoter

<400> 11

aaactgcagc tctagaggcg gcttgcgccc gatgctagtc

40

<210> 12
<211> 70
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse primer
ermE promoter

<400> 12
aaactgcagc tctagatggc ccgggtatcg atcgtcgacg gcatgcggat cctaccaacc 60
ggcacgattg 70

<210> 13
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Forward primer ORF1

<400> 13
aggattaccc atatgttcga gaaccagcat 30

<210> 14
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Reverse primer ORF1

<400> 14
gcatgagcgt gggaattccg 20